Mariners Weather Log

Vol. 49, No. 3

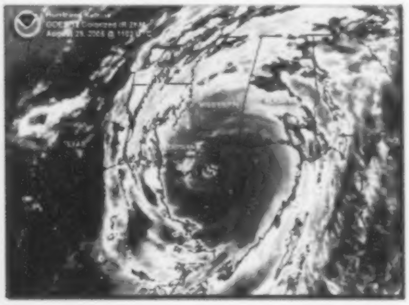
December 2005

The Power of Wind and Water

Destruction in the Port area of Gulfport, Mississippi

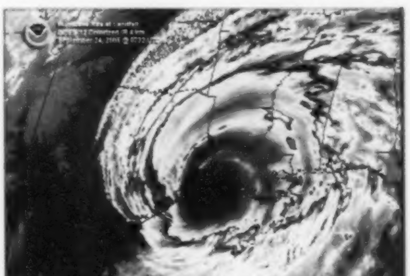
NOAA photo

Hurricane Katrina

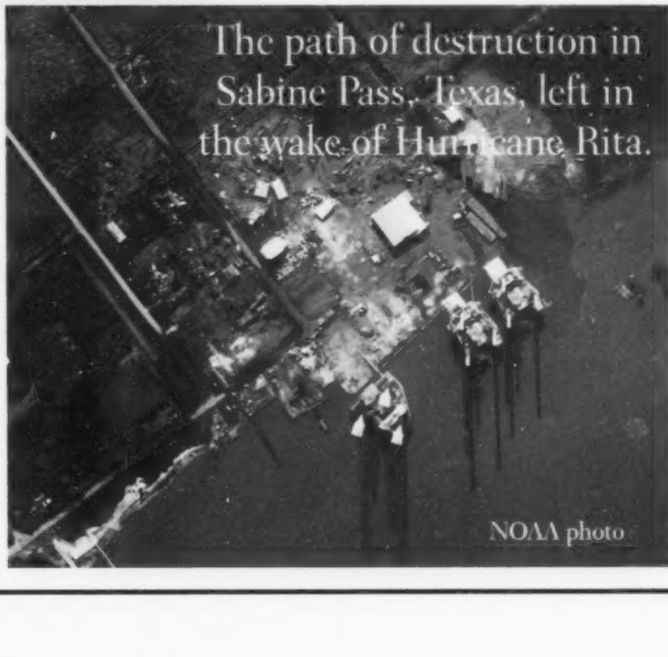


Containers from container parking lot strewn along highway 90 and into business and residential areas

Container Parking Lot with Copa casino relocated



Hurricane Rita



The path of destruction in Sabine Pass, Texas, left in the wake of Hurricane Rita.

NOAA photo

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Hello and welcome to another issue of the Mariners Weather Log (MWL). My basic guidelines for this introduction is to wish y'all well, pass on some interesting events that have happened since the last issue, and get you excited about what you are about to read in this issue. Well, all I can think about is a line from a Grateful Dead song, "Well, what a long strange trip it's been." The Mariners Weather Log calls south Mississippi home and we definitely got shaken, stirred, and tossed to the wayside with Hurricane Katrina. Between waiting for the insurance adjuster (mine finally showed up just before Halloween), clearing 150 foot tall (ok, long now) oaks off the shed, pool and house, standing in lines for gas, ice, MREs (don't try the pork riblet – ugh), I am actually one of the lucky ones. There are many folks here who do not have homes to go home to, or at least not where they left them anyway. Well, as Thomas Paine once said, "These are the times that try men's souls" so as long as we use a little common sense and keep on the right bearing, all will be just fine.

Ok, enough of my mindless wanderings. This is a very exciting issue that brings chills to my spine.—Oh wait! That is because we have a couple of articles about ice accretion on ships and about Great Lakes icing in an Electronic Atlas. Skip Gilham has yet another interesting historical article, this time about the PRINS WILLEM V, and our latest offering in the section "From the Desk of a PMO" comes all the way from Kodiak, Alaska. The National Hurricane Centers' (NHC) Tropical Review submission will be absent in this issue. Due to the extreme busy season we have experience, NHC has asked to defer their submission until the April issue. There is also a great story on how MARAD is helping out New Orleans by using some of the Maritime Academy training ships as berthing units for the recovery operations.

I just want to take a personal moment to thank everyone who has helped the entire Gulf South after Katrina, Rita and Wilma. Thanks for the many kind thoughts, prayers, and donations that have poured down to the coast from all over the world. Thank you from all of us and I hope you find this an enjoyable issue to read.

Thanks Once Again - Luke ⚓

Some Important Web Page Addresses

NOAA	http://www.noaa.gov
National Weather Service	http://www.weather.gov
National Data Buoy Center	http://www.ndbc.noaa.gov
AMVER Program	http://www.amver.com
VOS Program	http://www.vos.noaa.gov
SEAS Program	http://seas.amverseas.noaa.gov/seas/seasmain.html
Mariners Weather Log	http://www.vos.noaa.gov/mwl.shtml
Marine Dissemination	http://www.nws.noaa.gov/om/marine/home.htm
U.S. Coast Guard Navigation Center	http://www.navcen.uscg.gov/marcomms/

See these Web pages for further links.

Table of Contents

NOAA Offers Hard, Cold Facts About Great Lakes Ice in Electronic Atlas 4
Vessel Icing 9
The VOS Climate Project—The Way Ahead 16
Hurricane Rita and the Buoys 20
Shipwreck: Prins Willem V 21
Cape of Storms—August 2005 22
MARAD Ships Help in Hurricane Recovery 24

Departments:

From the Desk of a PMO

Rich Courtney, Kodiak Alaska 25

Marine Weather Review

Marine Weather Review—North Atlantic Area May through August 2005 26
Marine Weather Review—North Pacific Area May through August 2005 39
Mean Circulation Highlights and Climate Anomalies, May through August 2005 49

VOS Program

VOS Program Awards 51
New Recruits: July 1, 2005 through October 31, 2005 54
VOS Cooperative Ship Report January through October 2005 55

Points of Contact 69

NOAA Offers Hard, Cold Facts About Great Lakes Ice in Electronic Atlas

Reprinted with permission, NOAA Magazine, http://www.magazine.noaa.gov/stories/mag172.htm

June 15, 2005—For the past 30 years, NOAA has been keeping an eye on the ice in the Great Lakes. Researchers at the NOAA Great Lakes Environmental Research Laboratory in Ann Arbor, Michigan have tracked ice cover in this region, searching for signs of climate change, and gathering data to help them better understand ice and its impacts on the Great Lakes and other regions of the world.

MODIS image of Great Lakes snow and ice cover. Taken on February 26, 2004 at 16:40. http://modis.gsfc.nasa.gov/

Image courtesy of NASA

To share the vast amount of information about the ice, NOAA researchers published an electronic atlas of ice cover for the Great Lakes. The atlas contains data on more than 1,200 digitized Great Lakes ice charts for winters from 1973 to 2002 and offers three types of analysis of these ice charts. Data came from combined measurements from satellites, aircraft, shipboard observers and other sources. The atlas offers:

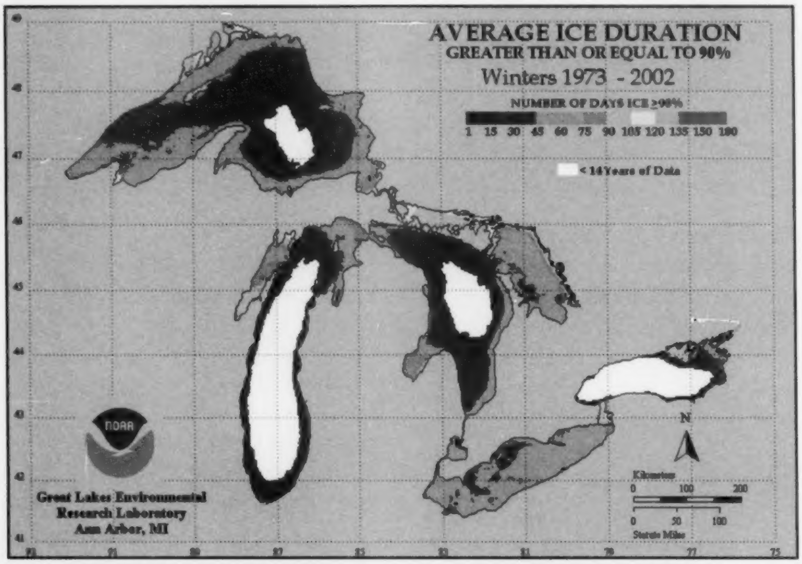
• Ice chart dates of the first reported ice, dates of the last reported ice, and ice duration for each winter, as well as statistics over the 30 winters—the maximum, minimum and average;

• A 30-winter set of annual daily ice cover time series. The daily time series was used to create computer animations of spatial patterns of ice cover for each winter and line plots of lake-averaged ice cover for each lake over the 30 winters;

• Weekly ice charts of maximum, 3rd quartile, median, 1st quartile and minimum ice cover concentrations for the 30-winter base period. The weekly statistics are based on the original ice chart data set and not on the daily time series.

Detailed documentation and description of analysis methods, and a discussion of the resulting products, supplement this atlas as a series of reports.

Coast Guard cutter towing ship through ice.



Average ice cover duration on Great lakes for winters 1973-2002.
Produced by R. Assel, NOAA GLERL 2004. Photo courtesy of "NOAA.")

The atlas contains a lot of information—1.4 gigabytes of data, much of which is in compressed files (about 4 gigabytes when uncompressed). The online version of this atlas can be used to browse and download a limited amount of data. However, because of its large size, it is not practical to download the entire atlas from the Internet. Therefore, it is also available on CD-ROM and DVD formats. To request a copy of the atlas on CD-ROM or DVD send an e-mail to Cathy.Darnell@noaa.gov or to iceatlas.glerl@noaa.gov. (Please provide your name and complete mailing address.)

The atlas and dataset are archived at the National Snow and Ice Data Center, but the NOAA Great Lakes Environmental Research Laboratory will maintain the Internet version of the atlas, for several years to come and will still continue to supply CD-ROM and DVD versions of the atlas after that.

Who will use the Great Lakes Ice Atlas?

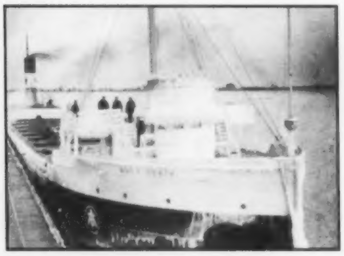
"The atlas is a resource for those seeking information on Great Lakes ice cover climatology. It provides a benchmark of ice cover and ice cover variation on the Great Lakes during the last quarter of the 20th century and the early years of the 21st century," explained Raymond Assel, a physical scientist at the NOAA GLERL, who (along with others) spent a decade working on this project.

Assel added that the Navy/NOAA National Ice Center and the Canadian Ice Service use information from this atlas in making operational Great Lakes ice charts. Portions of these data have also already been used by other federal and state government agencies, academia and the private sector for research, educational, operational and engineering applications.

Ice formation in the St. Joseph channel. Lake Michigan EEGLE cruise Feb. 18, 2000 Lake Guardian pre-plume survey.
Photo courtesy NOAA GLERL.

What are the Impacts of Ice Cover on the Great Lakes?

When ice forms on the Great Lakes each winter, both humans and the weather/environment around the region are impacted (i.e., more ice cover means less evaporation and therefore often less lake effort snow over the Great Lakes region). Some of the human uses that are affected include the fishing industry, coastal zones and navigation:

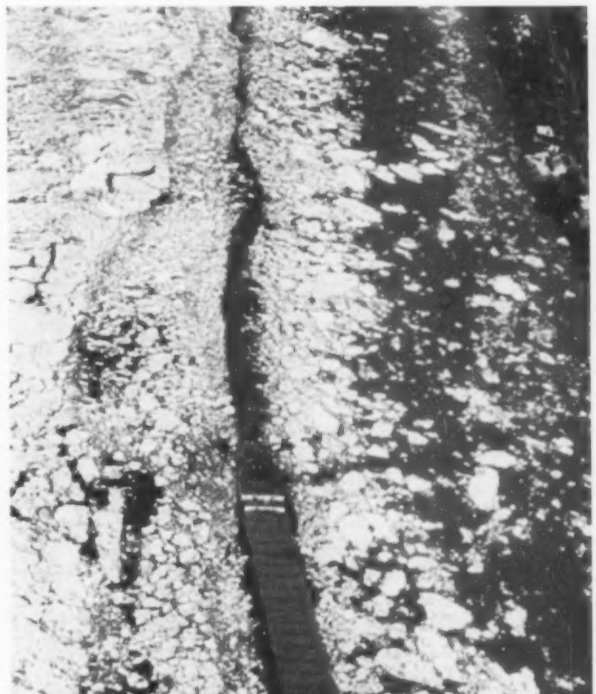


• **Effects on Fishing**: Generally ice cover is a good thing for both commercial and recreational fishing. Ice plays a major role in ecology and climate around the Lakes. It is particularly important to the reproduction of fall-spawning fish, such as whitefish, whose eggs lie in the cold water during winter. "When you do have extensive ice cover, you tend to have more eggs survive into the spring," Assel said. "Open water leaves the eggs vulnerable to wind, waves, predators or even being tossed onshore."

• **Effects on Rivers**: Ice jams can form when ice flows amass and obstruct normal water flow from one lake to another through the rivers that connect the Great Lakes (St. Marys River, St. Clair River, Detroit River and Niagara River). This lack of water downstream can adversely affect hydropower electricity production, often forcing electrical power distributors to find alternate sources of power. Since ice jams act like dams, flooding can also occur upstream of an ice jam. To make matters worse, when an ice jam dissipates, large quantities of water and ice move downstream, often damaging shoreline property. An ice control structure called an "ice boom" is installed at the head of the Niagara River at the east end of Lake Erie in early winter to help prevent ice jams.

• **Effects on Coastal Zone**: Ice formation along Great Lakes coastlines can be highly beneficial. In a typical winter, ice forms a solid anchor along most shorelines, which acts as buffers against strong winds and waves. A solid ice cover on bays and inlets also protects wetland communities from disruptive storm events and associated erosion. In many cases, ice formation on bays, inlets, major rivers and around islands is essential for recreational activities, such as ice fishing and snowmobiling.

• **Effects on Navigation**: A hard winter can cause extremely heavy ice buildup along navigation channels in the Great Lakes region. Ice buildup can be a navigational hazard and can disrupt commercial shipping in the early winter and/or delay the opening of the next shipping season. Since ice cover usually reduces evaporation over the lake, a cold winter can moderate water loss from the lake during low water periods. Higher water levels allow commercial shipping companies to carry more of their commodity and make fewer trips. Many Great Lakes and connecting channels have ice control measures, such as ice booms and ice breaking, to limit damage and keep these waterways ice-free.



Freighter moving through ice channel.

Climate Trends in Great Lakes Ice Cover

The Great Lakes ice atlas data indicates that a trend for below average ice conditions persisted over the entire Great Lakes from 1998 to 2002 (***Figure 1***). However, more data needs to be collected and analyzed before researchers will know if a lower ice cover regime has started.

Research has shown that a strong El Niño event is a precursor to above average winter temperatures and below average ice cover on the Great Lakes. This is most evident in the winter of 1997-1998, which followed an extremely strong El Niño period. Ice cover following this El Niño event was near record lows as shown on the graph.

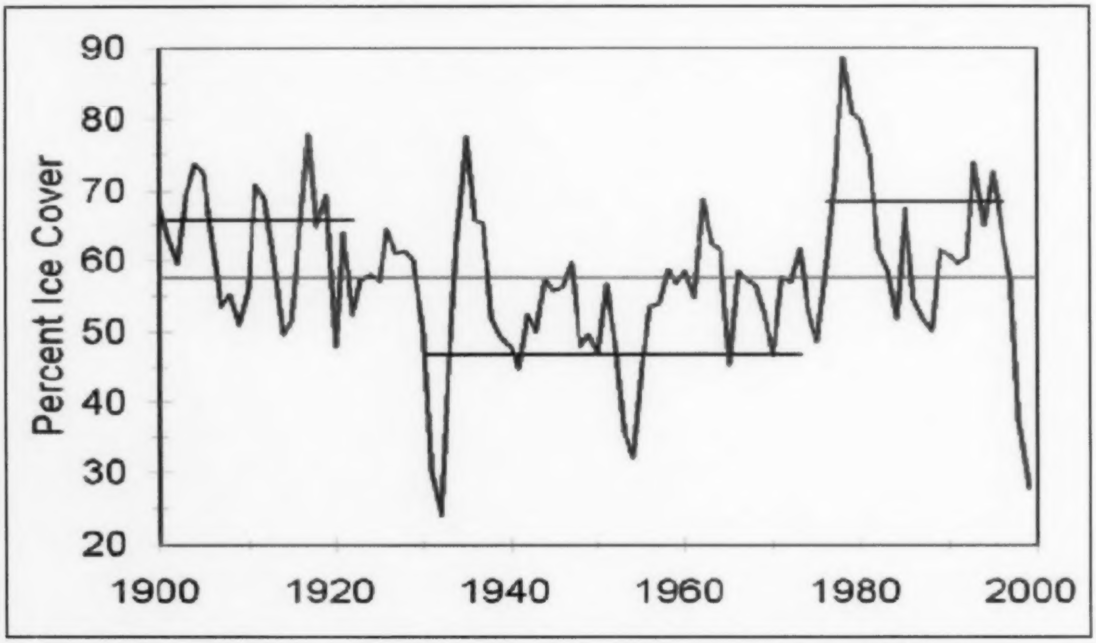


Figure 1.–Graph showing three-year moving averages of annual maximum ice cover. Red line is long-term mean. black lines are periods of above and below that long-term mean.
Photo courtesy "NOAA.")

Relevant Web Sites

NOAA Research: http://www.research.noaa.gov/

Great Lakes Products/NOAA National Geophysical Data Center: http://oas.ngdc.noaa.gov/drs/prod_d/ngdc_products.disc_prods?disc=G16

Great Lakes Online: http://glakesonline.nos.noaa.gov/

NOAA GREAT LAKES LAB ON MISSION TO LAKE ERIE DEAD ZONE: http://www.noaanews.noaa.gov/stories2005/s2427.htm

Thunder Bay National Marine Sanctuary and Underwater Preserve (Alpena, Michigan): http://thunderbay.noaa.gov/welcome.html

NOAA Research in Michigan: http://www.oarhq.noaa.gov/nriys/nriys.asp?id=MI

Science with NOAA Research: Great Lakes: http://www.oar.noaa.gov/k12/html/greatlakes2.html

'NO BALLAST ON BOARD' DOESN'T MEAN 'NO ORGANISMS ON BOARD' SAYS NOAA / UNIVERSITY GREAT LAKES REPORT: http://www.noaanews.noaa.gov/stories2005/s2435.htm

Media Contact: Jana Goldman, NOAA Research, (301) 713-2483

Vessel Icing

Dr. Peter Guest, Research Associate Professor of Meteorology, Naval Post Graduate School, Monterey, CA & Adapted by Robert Luke, Voluntary Observing Ship (VOS) Program Lead

The most serious form of icing affecting marine operations near the surface (ships, buoys, platforms) is from sea spray. The information provided in this article is from a Naval Post Graduate School (NPS) meteorology module that focuses on sea spray vessel icing, it will focus on what icing is, how icing can affect marine operations, the causes of vessel icing, how to predict icing situations, and how a vessel can mitigate icing.

Description of sea spray icing

Sea spray icing is a serious hazard for marine operations in high latitude regions. Many ships and lives have been lost when ships sank, or became disabled, after the accretion of ice on decks and superstructures. Large amounts of ice can raise the center of mass on a ship enough to result in a catastrophic loss of stability.

Capsizing, extreme rolling and/or pitching, and topside flooding can occur as a result of the loss of stability and extra weight from the ice burden. The problem is particularly dangerous for smaller ships, such as fishing vessels, because they are more likely to be exposed to sea spray and a relatively smaller amount of ice is required for destabilization.

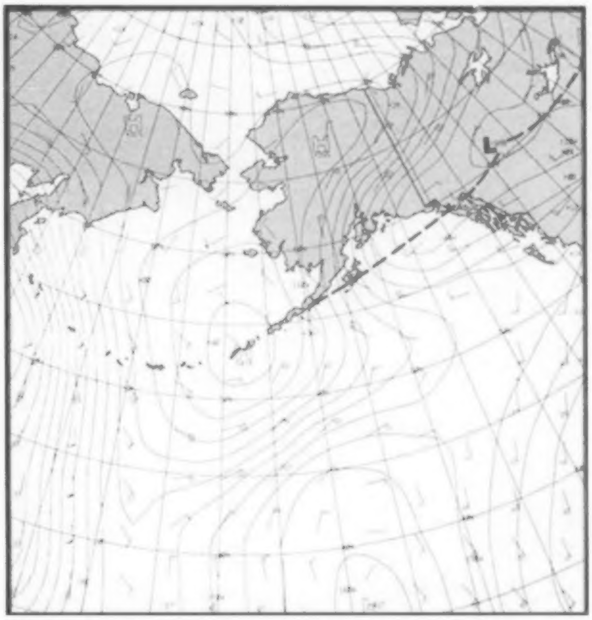


Figure 1.–The Fleet Numerical Meteorology and Oceanography Center (FNMOC) surface pressure chart for 0600 UT, January 29, 1989. Note the region of tight pressure gradient and high-speed off-shore winds in the western region of the Gulf of Alaska. Taken from Fett et al. (1993) pages 7–9.

Ships with relatively large superstructures and low free board are more likely to experience serious destabilization problems due to icing.

On any ship, communication and navigation equipment, and most any type of deck operation, can be severely impacted or rendered useless by sea spray icing.

Overland (1990), Fett and Kozo (1992) and Fett et al. (1993) describe a tragic example of the effects of sea spray icing. During the period January 23–27, 1989, there was heavy icing in the Bering Sea region that was correctly forecasted to occur. Heeding the forecast, a fleet of 140 crab fishing vessels remained safe in the lee of the Pribilof Islands. By January 29, the region of heavy icing had moved to the Gulf of Alaska as forecasted. ***Figure 1*** shows a trough that extended from a low over the Yukon toward a high over the Aleutian Islands, creating strong offshore winds over the western portion of the Gulf of Alaska. The cold air advection during this

(On the left) The forward bulkhead of the Research Vessel 'Knorr' during a scientific cruise in the Labrador Sea in late winter 1997.
Photographed by George Tupper. From Pickart (1997) in Oceanus Magazine.

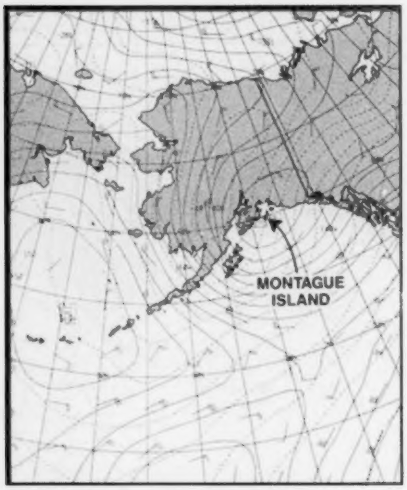


Figure 2.–The Fleet Numerical Meteorology and Oceanography Center (FNMOC) hPa pressure chart for 0600 UT, January 29, 1989, showing the region of intense cold air advection over Kodiak Island (the large island to the southwest of Montague Island) and the surrounding ocean. Just south of Kodiak was where the he Vestfjord was lost four hours later. Taken from Fett et al. (1993), pages 7–10.

period is best seen on the 850 hPa chart from six hours earlier (***Figure 2***).

One crabbing vessel, the 31 m **F/V Vestfjord**, attempted to cross the Gulf of Alaska from the east during this period. The ship had missed the start of the crabbing season along the ice edge in the Bering Sea and the captain was attempting to make up for lost time. Whether he was aware of the severe icing forecast and chose to ignore it, or was just unable to seek shelter, will never be known. The last report came from the ship just before 1010 UTC, on January 29, approximately 60–70 nmi south of Kodiak Island when the captain reported heavy icing. By the time of the report, it was probably too late to take evasive action and the ship was never heard from again, a loss of six lives.

Causes

Sea spray icing occurs when cold, wave-generated spray comes in contact with exposed surfaces and the air temperature is below freezing. There are two general factors to be considered, environmental factors and the vessel's characteristics.

The environmental factors which affect sea spray icing are wind speed, air temperature, water temperature, the freezing temperature of water, relative wind direction, and the sea and swell wave characteristics (height, period, propagation direction.

The wind speed, air and water temperatures are the most important factors used to determine the potential for sea spray icing. With the freezing temperature of water being nearly constant, the relative wind direction can change easily and the sea height values are related to the wind.

Vessel icing can occur when the following environmental factors are present:

High Wind Speed—Usually above 18 kts or 9 m/s but sometimes lower

Low Air Temperature—Below freezing (-1.7 °C or 29 °F)

Low Water Temperature—Usually below 7 °C or 45 °F

The first two factors, high wind speed and low air temperatures, are associated with cold air advection or cold air moving into a region. Cold air advection often occurs after the passage of a cold front. It is most intense when air formed over continents or ice regions (i.e. Polar Continental, Arctic and Antarctic air masses) moves over open water in the late fall, winter or early spring. Long, closely-spaced bands of low level cumuliform clouds called 'cloud streets' are a sure sign that cold air advection is taking place over water. Cloud streets are very distinctive and easy to spot on satellite images (***Figure 3***).

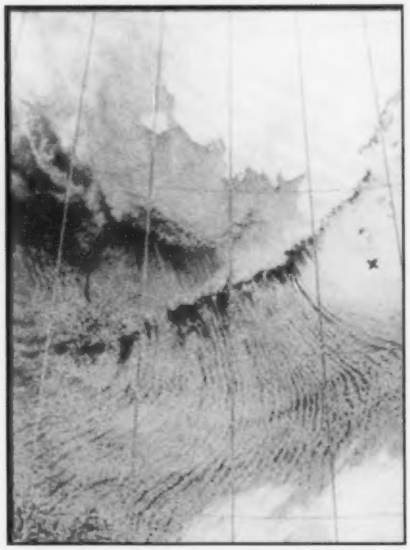


Figure 3.–Cloud Streets Infrared satellite image on 0552 UT, January 29, 1989, showing cloud streets associated with cold air advection in the Gulf of Alaska. The Aleutian Islands are in the center of the image. This is about four hours before the Vestfjord sank, as described earlier. The last reported location of the Vestfjord is indicated by dark cross in the central right area. Taken from Fett et al. (1993) pages 7–11.

The cold advection, and associated serious icing, is most intense when an ice edge or shore is less than 200 km (108 nmi) upwind. At further distances the air becomes warmer and icing is less likely to develop. Very close (less than about 5 km or 3 mi, the exact distance is dependent on the vessel) to a shore or ice edge, waves are not developed and, hence, there is protection from icing even when the above conditions are met. In the Northern Hemisphere, icing is most likely to occur in the northern por-

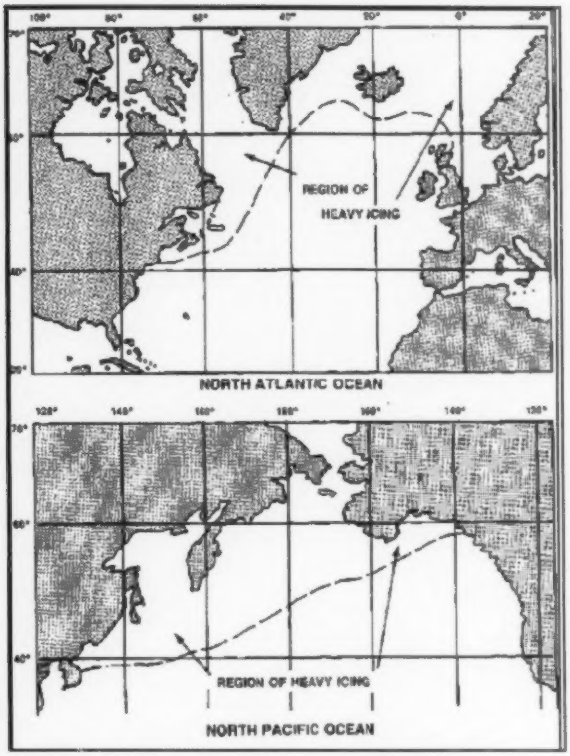


Figure 4.–Regions in the North Atlantic (top) and North Pacific (bottom) where icing generally occurs. Taken from U.S. Navy (1988), p 7–2

tions of the Atlantic and Pacific Oceans (***Figure 4***). It also can occur everywhere in the Arctic Ocean and in the Southern Ocean surrounding Antarctica.

In addition to the environmental factors discussed above, the severity of sea-spray icing depends on vessel characteristics. Icing can only occur when there is a source of water for wetting the deck, superstructure and other exposed parts of a ship. Some ship factors to consider are ship's speed, heading (with respect to wind, waves and swell), length, amount of freeboard, handling, and cold soaking aspect. In general, for the same environmental conditions there will be more sea spray reaching the ship deck, superstructure etc. when the ship is traveling faster, into the wind and waves, and for smaller ships and ships with less freeboard. Overland discusses these factors in detail. He calculated a threshold significant wave height, $h_{1/3}$, and associated wind speed, for a 200 km fetch at which enough sea spray reaches the decks and superstructures to cause severe icing, assuming cold air and water temperatures are also present (***Table 1***).

Note: This is only a rough guide for ships steaming into the wind and waves. The actual potential for icing depends on the type, load, and handling characteristics of a particular ship. Any captain or bridge officer who is familiar with a ship should be well aware of the wind speeds which cause sea spray to reach the deck and superstructure, and should base their assessment on the potential for icing on this knowledge.

Another ship factor to consider is cold soaking[5]. When a ship has been in cold temperatures for a long time (2–3 weeks for most vessels) the body of the ship will remain cold even if the air temperature is warmer. In this situation, icing may be more severe than expected given the current environmental conditions.

A dangerous coating of ice on the NOAA Ship MILLER FREEMAN in the Bering Sea, Alaska. Such icing can affect a ship's stability and cause capsizing.
Photo from the NOAA Library Ship Collection
Photo courtesy of NOAA NMAO Pacific Marine Center

Table 1.–Threshold Wind Speeds for Icing to Occur on Various Length Ships

Parameter						
Vessel Length						
meters	15	30	50	75	100	150
feet	49	98	164	246	328	492
Significant wave height - $h_{1/3}$						
meters	0.6	1.2	2.0	3.0	4.0	6.0
feet	2.0	3.9	6.6	9.8	13.1	19.7
Wind Speed at 200 km (108 nmi) fetch						
meters/second	5.0	7.4	9.8	12.5	15.0	20.0
knots	9.7	14.4	19.0	24.3	29.3	38.9

Prediction of Vessel Sea Spray Icing

Algorithms were developed[3,4] that have proven to be useful for predicting sea spray vessel icing. These algorithms were based primarily on reports from vessels that were 20 to 75 meters in length.

PPR = Icing Predictor
Va = Wind Speed (m s^{-1})
Tf = Freezing point of seawater (usually -1.7 °C or -1.8 °C)
Ta = Air Temperature (°C)
Tw = Sea Temperature (°C)

$$\mathbf{PPR} = \frac{\mathbf{V_a(T_f - T_a)}}{\mathbf{1 + 0.3(T_w - T_f)}}$$

Table 2 shows the expected icing class and rates for 20 - 75 meter vessels that are steaming into the wind.

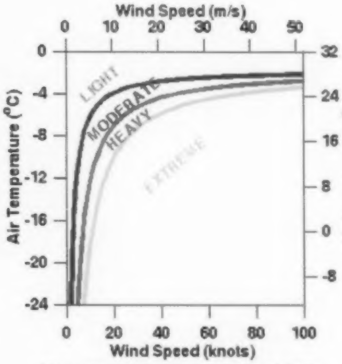
Table 2.–Icing Class and Rate

PPR	<0	0-22.4	22.4-53.3	53.3-83.0	>83.0
Icing Class	None	Light	Moderate	Heavy	Extreme
Icing Rates (cm/hour) (inches/hour)	0	<0.7 <0.3	0.7-2.0 0.3-0.8	2.0-4.0 0.8-1.6	>4.0 >1.6

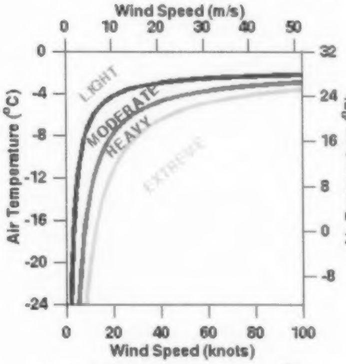
These icing rates are only a guide. Actual icing rates depend on ship characteristics, cold soaking and exposure to sea spray.

Using the Algorithm

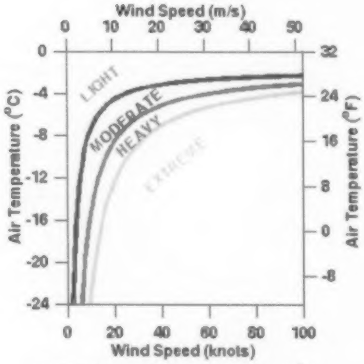
The following nomograms have been developed for a quick reference. They display sea spray icing potential class as a function of wind speed and air temperature for a given sea temperature. These nomograms are slightly different from the ones found in US Navy[5] because they are based on the most recent work by Overland[3]. The main difference is that the effect of cold sea water is emphasized more in the nomograms shown here. Generally, icing is not a problem at sea temperatures greater than 7 °C, and no cases with higher temperatures were considered when the algorithm was derived. Because it may be possible for icing to occur at these higher sea temperatures, they have been included on the following page.



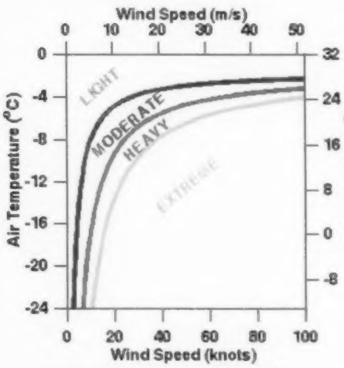
Water Temperature = -1.5 °C 29.3 °F



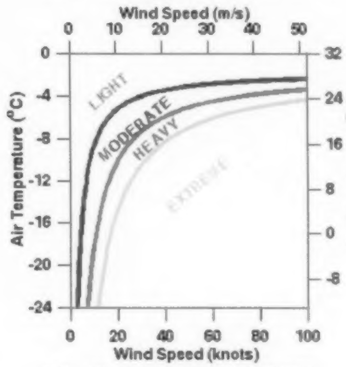
Water Temperature = -1 °C 30.2 °F



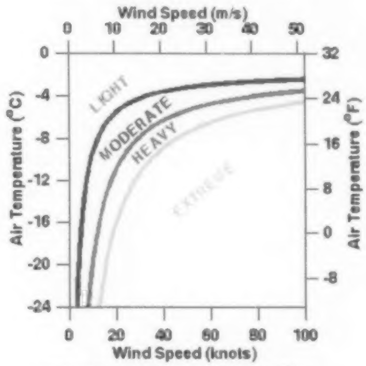
Water Temperature = -0.5 °C 31.1 °F



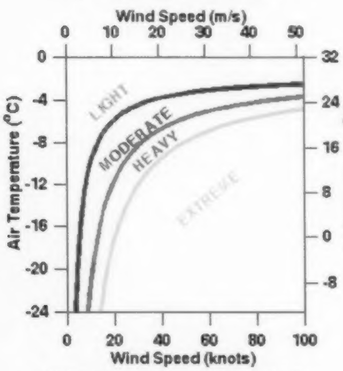
Water Temperature = 0 °C 32 °F



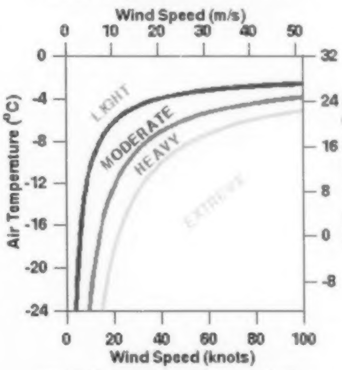
Water Temperature = 0.5 °C 32.9 °F



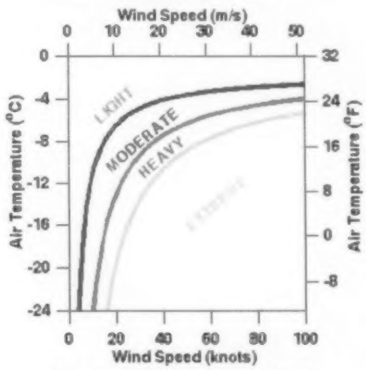
Water Temperature = 1 °C 33.8 °F



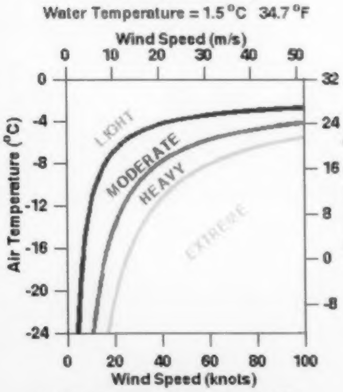
Water Temperature = 1.5 °C 34.7 °F



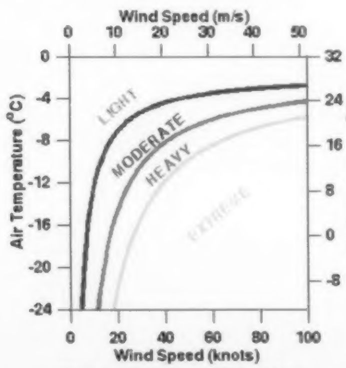
Water Temperature = 2 °C 35.6 °F



Water Temperature = 2.5 °C 36.5 °F



Water Temperature = 3 °C 37.4 °F



Water Temperature = 3.5 °C 38.3 °F

These nomograms assume a freezing water temperature of -1.7 °C, which is typical for sea water. Icing can occur in fresh water lakes such as the Great Lakes. If you want to use the nomograms for a fresh water case, subtract 1.7 °C (-3.1 °F) from the water temperature and add 1.7 °C to the air temperature before using the tool, or just use the algorithm at the top directly and use $T_f = 0$.

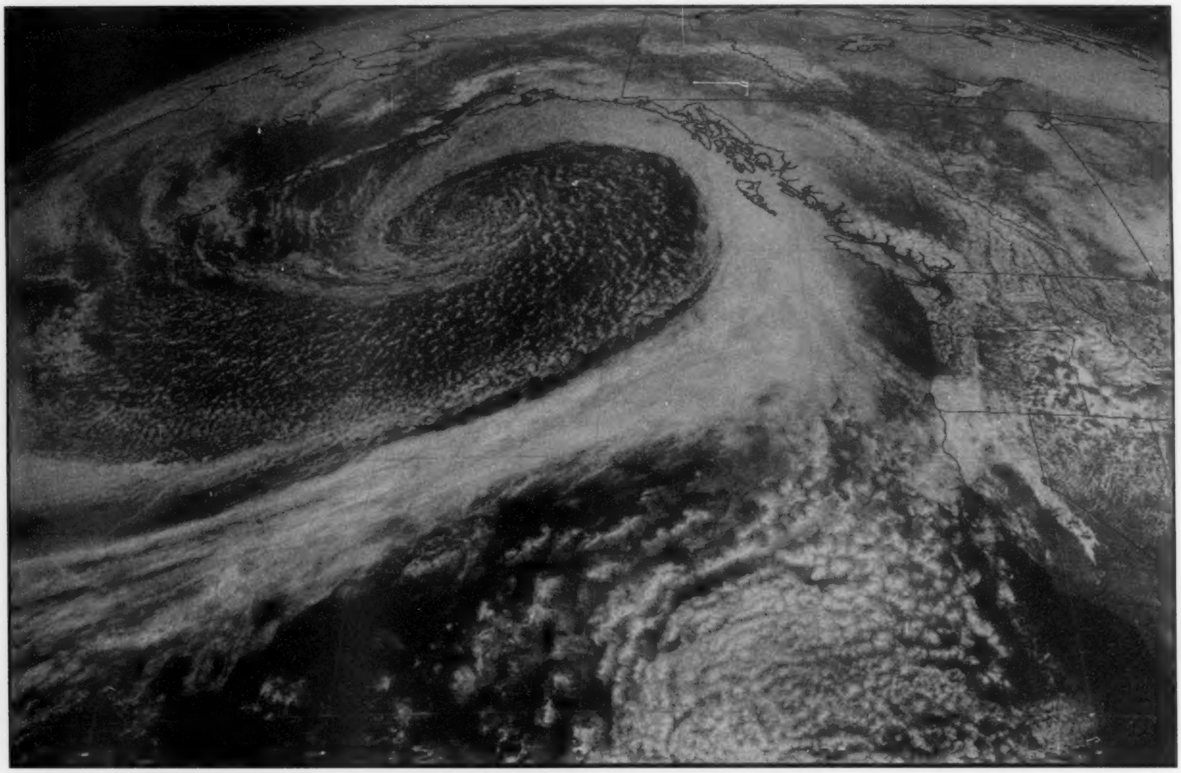


Figure 5.–GOES10 2100 UTC on April 6, 2003
Image courtesy of National Climatic Data Center (NCDC)

Mitigation and Avoidance of Vessel Sea Spray Icing

Weather Conditions

Remember sea spray icing is associated with areas of cold air advection and cold sea temperatures. Obviously, the first and foremost way to avoid icing is to stay clear of the weather conditions that induce icing. OK, reality sets in and operational requirements make that idea a fantasy. What then? You can use the forecast guides to help you navigate the path of least icing. As a mariner, you should also be aware that Polar Lows (***Figure 5)*** are fast-forming, intense mesoscale cyclones that are often not predicted accurately. Due to their high winds and formation in cold air, they can be associated with severe icing. Be especially aware of the possibility of a Polar Low if you are trying to avoid an icing situation.

Ship Maneuvers

If you are caught in a dangerous icing situation, the best thing to do is to **seek immediate shelter** in a harbor or downwind of a land mass such as a coastline, peninsula or island. In these regions, the wind may still be strong, but the waves will be small, thus minimizing sea spray. If shelter is not available, then **steam downwind** to minimize sea spray on the ship's deck and superstructures. For some ships, it may be better to minimize sea spray by heading into the seas. Do not wait until the ship has accumulated a large amount of ice. Turning through the trough can be deadly for a ship that has been destabilized by ice accretion.

Preventative Coatings

"Ice-phobic" (ice fearing) coatings can be applied to repel water and prevent ice build-up. Ice that does form over the coatings will be easier to remove. U.S. Navy[5] recommends two ice-phobic coatings for prevention of sea spray icing on vessels:

1. **Fluorocarbon penetrating coating (FPC):** This is used to reduce hull drag and has been found to be a good ice-phobic coating as well.
2. **Vellox 140**

There are problems with using ice-phobic coatings. They must be constantly reapplied because they tend to fall off when water and ice brush against them. They should not be applied to areas where people will be walking because they are very slippery. For these reasons it is not practical to use them on all susceptible surfaces. Concentrate on critical areas that are most affected by ice accretion. Ice-phobic coatings alone should not be relied upon to prevent sea spray icing, but they may help facilitate physical removal. These are hazardous materials and should used in accordance with published guidelines.

Ice and Snow Removal Methods

Once ice has formed it is necessary to remove it to prevent ship damage and instability. This requires advance planning. Organize crews to remove ice whenever it is safe to be on deck. Remove the ice before it reaches dangerous amounts. Usually physical removal is the most effective method.

One of the following two tools is essential; baseball bats or large wooden mallets. Stock up before you leave port and bring plenty of extras since they tend to break easily.

The advantage of these heavy wooden tools is that they can remove ice effectively, but will not damage the ship and equipment as much as metal objects.

The following tools are also useful: steel-bladed ice scrapers, straight bottom shovels, spades, hoes, picks, brooms, or snow shovels. The ice scraper and straight bottom shovels are useful for removing thin ice from decks. The spades, hoes, and picks can be used for thicker ice and the brooms and snow shovels remove snow that can cause problems when it gets wet and then freezes. Obviously, all these tools must be used with care to prevent damage to the ship and topside equipment.

Chemicals can be used to remove ice but caution must be used when working with these items to avoid corrosive damage to your metalwork and to keep your crew safe.. The most economical chemical that could be used is sodium chloride or rock salt.

1. **Rock Salt (Sodium Chloride)** Most economical
2. **Calcium Chloride** Faster acting than rock salt
3. **Urea** Less corrosive than above
4. **Ethylene Glycol**
5. **Methanol**
6. **Other light de-icers including alcohols**

1–3 can be sprinkled on decks to supplement physical removal. 4–6 can be applied with a garden sprayer to sensitive equipment that might be damaged by a bat or mallet. Follow all hazardous materials guidelines when using these chemicals.

If available, the following devices are effective for ice and/or snow removal:

1. **Portable hot air guns** Small ice deposits and spot thawing of pipes
2. **Electric hair driers** Same uses as 1.
3. **Steam lances**

Although there are thought processes on the development of vessel icing and several ways of mitigating this marine phenomenon have been discussed, there is no sure way of avoiding icing conditions due to the harsh nature of the environment and the ship's routes to "get the job done." Many factors have to be considered and it is usually the seasoned experience of the captain that truly understands their ship and the situation encountered as to what needs to be done. As it has been said before, "knowledge is power."

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The VOS Climate Project—The Way Ahead

Sarah C. North, MET Office (UK)—VOSClim Project Leader

The Voluntary Observing Ship Climate Project (VOSClim) is about to enter a new and crucial stage in its development. Having survived a turbulent period, during which the size of world VOS fleet has been in decline, the project has now matured sufficiently for work to start on evaluating the true quality of the data being collected. During this new 'evaluation phase' the scientific advisers to the project aim to determine the 'added-value' of the VOSClim data, which will in turn help to determine the long term future of the project.

However, before charting the project's way forward, we should perhaps briefly remind ourselves of the reasons why the project was established in the first place, and how it works - from the perspective of all the key contributors—the Observers, the Port Met Officers, the National Met Service staff and the Scientific Community

The aims and benefits of VOSClim

The VOSClim Project aims to establish a comprehensive data set of marine meteorological observations, available in both real-time and delayed mode, together with detailed information on the type and exposure of each ship's meteorological instruments and arrangements. This high quality climate data set, compiled from the weather reports received from ships operating on a global scale, will provide scientists and researchers with an invaluable resource for their studies. It will help them to better evaluate the effects of climate change (which has the potential to impact all our lives), and to further their research into climate prediction.

Careful analysis of the VOSClim datasets will also help to improve the overall quality of ships' observations, by assessing the accuracies and biases associated with various instruments currently in use. It will therefore act as a benchmark dataset against which the accuracy of wider VOS fleet can be assessed.

Gaining a better understanding of the actual observing environment on each participating ship will not only help to improve the overall accuracy of the observations but will, in turn, help to improve the quality of our forecast model outputs. As our operational marine forecasts improve, we will therefore be helping to further ensure the safety of ships, their crews and their cargoes.

The Observer's Contribution

It must be stressed that without the efforts of voluntary observers, submitting quality observations, the project would not exist.

For an observer on a participating VOSClim ship the procedures should appear almost seamless when compared to the procedures for a standard VOS. Each observation transmitted to the National Met Service in near real time is composed in exactly the same format as a standard VOS observation. The difference only occurs with the delayed mode observation data, which requires six additional pieces of information that are not included in the SHIP coded message, namely—the ships heading and speed over the ground at the time of the observation; the relative wind speed and direction; the height of any deck cargo above the ships maximum summer load-line; and the difference between this load-line and the actual sea level. Because electronic logbooks (such as SEAS and TurboWin) have been recommended for use on VOSClim ships, the collection of this additional data is made relatively simple for the observer.

Observer Suzanne Allen, Second Officer checking the pressure using a precision Aneroid Barometer on the RRS Charles Darwin

Photo by H. Gale, PMO

The Port Met Officer's Contribution

The Port Met Officers act as the interface between the observers and the National Meteorological Services and their involvement is also essential to the success of the project

At the time of recruitment the visiting Port Met Officer will collect all the necessary information about the ship, and the location, type and exposure of its meteorological instruments. This data (known as 'metadata') is essentially the same as that collected for a standard VOS, which is compiled within WMO Publication No 47[1]. However, to support the metadata for VOSClim, the Port Met Officer will additionally take digital photographs

PMO Harry Gale presents Captain David Newnes with a VOSClim Certificate
Photo by R. Sturdy 3.O.N.

of the instruments and arrangements, and prepare ship profile drawings showing the location of the instruments, noting any particular characteristics that might influence the meteorological readings e.g., superstructure overhangs, ships ventilation exhausts that could affect the flow of air through a marine screen, or outflows on the hull that could affect sea temperature measurements.

The Port Met Officers also help by identifying suitable ships for recruitment. Within the limitations of ships' trading patterns, the aim of the project is to provide global coverage, but at the same time ensuring that candidate ships can be routinely inspected and relied upon to provide regular high quality observations. To encourage representative participation, and to help increase the level of participation, the project aims to obtain observations from as wide a range of observing ship systems as possible, and a number of ships fitted with automatic weather systems are now also included in the VOSClim fleet.

In order to promote the project to potential new ship recruits, the Port Met Officer will usually provide a copy of the explanatory VOSClim project brochure, which has been designed to answer most of the key questions that ship masters and observing officers may have about the participating in the project.

Following recruitment the Port Met Officers aim to inspect VOSClim ships at regular intervals in order to ensure the accuracy of the metadata, and to provide guidance and instruction to observers. During the inspection the Port Met Officers will usually download the additional delayed mode project data from the electronic logbooks and return it to their National Met Service for processing. To recognise the efforts and contribution of observers, the Port Met Officer will also issue each project ship with a VOSClim Certificate of Participation.

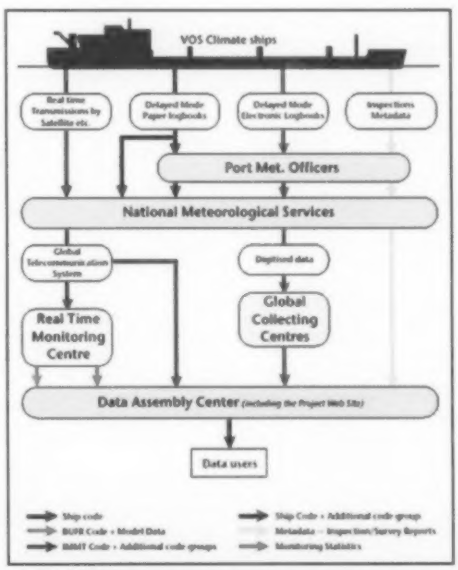
The Met Service's Contribution

The National Meteorological Services oversee the project's efficient operation. To ensure that the correct procedures are followed, and that the data is correctly routed, two key processing centres have been established—a Real Time Monitoring Centre (RTMC) and a Data Assembly Centre (DAC). These are located, respectively, at the Met Office (in Exeter, UK) and at the National Climatic Data Center (in Asheville NC, USA). In addition the project also incorporates the services of the two Global Collecting Centres (GCC's) which are already established for the receipt, quality control and dissemination of standard VOS observations. These are located in Hamburg, Germany and Edinburgh, Scotland.

Upon receipt of each real time observation from a project ship the RTMC appends the six co-located parameters from the Met Office forecast model—pressure, relative humidity, air temperature, sea temperature, wind speed and wind direction. These combined datasets are then transferred to the DAC on a daily basis. In addition the RTMC has responsibility for monitoring the quality of the ship observations against defined criteria, which are set at a tighter level than for standard VOS. These quality monitoring statistics, together with lists of those ships whose observations have failed to meet the required criteria, are then relayed to the DAC and to the national VOSClim focal points in order that any identified problems can be addressed

Meanwhile minimum quality control procedures are applied to the delayed mode observations that have been collected by the Port Met Officers (and which include the additional project code groups), before they are sent to the GCC's. Having checked the data quality, and clarified any problems bilaterally, the GCC's then send the delayed mode data to the DAC.

All these project data sets, in real and delayed mode format, together with model parameters and the quality monitoring information are then made



Simplified flow diagram showing the routing of VOSClim data

available for downloading to the scientific community from the project website, which is hosted by the DAC at http://lwf.ncdc.noaa.gov/oa/climate/vosclim/vosclim.html. In addition to acting as a focus for data exchange, the website is also used as the repository for all the essential project information—including up-to-date lists of all participating ships and links to their metadata; the monthly monitoring statistics supplied by the RTMC; and copies of the necessary project documentation and certification.

The Scientist's Contribution

The real benefits of the VOSClim data can only be quantified following careful analysis by the scientists and climate researchers who are acting as advisers to the project.

The metadata, for instance, are being used by the scientific advisers in order to quantify the random and systematic errors associated with the ships instruments and observations. In this regard the first scientific paper using the VOSClim data and metadata was recently published in the International Journal of Climatology[2]. This paper examines the quality of air temperature measurements taken using marine screens. It compares visual assessments of the screen exposures (drawn from photographs taken by Port Met Officers) with statistics of the differences between ship and model air temperatures from the VOSClim model data stream.

Example showing the inside of a well-exposed plastic marine screen installed on VOSClim ship P & O *Nedlloyd Manet*
Photo by H. Gale, PMO

As the volume of VOSClim data increases we will be able to increase the scope of the scientific analysis. By making comparisons with forecast model data, and averaging out any problems caused by individual ships or bad forecasts, we should get a clearer overview of the data quality. For instance, the model data has already been used to make bias comparisons with sea temperature measurements from ships using different measurement methods e.g., engine intakes, sea water buckets and hull sensors. The results indicate that sea temperatures from buckets are often colder than those of the model, while sea temperatures from engine intakes and hull sensors are often warmer. This may be due to cooling of the water in the bucket during retrieval, or warming of the intake water by the ships engines.

The Current Status and remaining obstacles

Since the project first went operational at the end of 2001 a total of 139 ships have been recruited (i.e. by June 2005) of which 13 had been withdrawn for various reasons e.g., ship sold or scrapped, changes in owners, trading patterns etc. Nine countries have recruited ships to participate in the project, as shown in the table above.

Recruiting Country	Total Recruited (since start of project)	Total Withdrawn (since start of project)	Total Active (June 2005)
Australia	13	3	10
Canada	14	0	14
France	7	0	7
Germany	11	0	11
India	24	2	22
Japan	5	0	5
Netherlands	1	0	1
UK	52	8	44
US	12	0	12
TOTALS	**139**	**13**	**126**

Unfortunately recruitment is still short of the target figure of a minimum of 200 ships set at the outset of the project—possibly a reflection of the fact that VOS operators are increasingly faced with resource limitations, in some cases leading to reduced PMO numbers. However, it should be noted that the figure of 200 ships was intended as an initial target based upon the recruitment levels originally anticipated by participating countries - and that the overall required level of participation will inevitably need to be revised as a consequence of the scientific assessments currently being undertaken. Participating countries are nevertheless being strongly encouraged to increase their recruitment levels, and several have already pledged to recruit additional ships.

Although the real time and delayed mode data transmission routes to the DAC appear to be operating as planned, there remain some hurdles to overcome. In particular there have been some problems with the flow of the delayed mode data via the GCC's to the project website, partly due to failure by some contributing countries to apply the required minimum quality control standards to the data, or to use

the correct data format. As a temporary measure this problem is being overcome by participants providing the raw data from the electronic logbooks directly to the Scientific Advisers. Similarly problems have been experienced due to gaps in the real time and model data flow from the RTMC to the DAC, although action is in hand to recover any lost data.

The Future of VOSClim

At a recent meeting of the Joint WMO/IOC Technical Commission for Oceanography and Marine Meteorology (JCOMM) Ship Observation Team, which now oversees the project's development, it was agreed that the time was right for the project to progress from its 'implementation phase' into an 'evaluation phase'.

During this evaluation phase the Scientific Advisers will assess the 'added-value' of VOSClim data by comparing it with data from the wider VOS. This will allow the identification of which, if any, of the VOSClim project components are acting to improve the quality of VOS data. As a consequence it should then be possible to make recommendations on how to extend the improvements to the wider VOS. Based upon the results of this assessment, a strategy for the future maintenance of the VOSClim high-quality dataset will be developed. A determination will also be made of how many ships and observations are needed to ensure the on-going quality of the dataset, and the value of the additional delayed mode parameters being collected for the project.

To progress this work the Scientific Advisers will also convene an informal 'Scientific Users Group' to widen expertise, and to guide the development, assessment and exploitation of the value of VOSClim dataset. The dataset, which will contain the ship report, model output and delayed mode parameters, will eventually be advertised and made available to users internationally.

As the project becomes increasingly established its profile is being raised in a variety of international forums. For example it will form one of the presentations at the forthcoming Second International Workshop on Advances in the Use of Historical Marine Climate Data (MARCDAT-II), to be held at the Hadley Centre, Exeter, UK, from 17 to 20 October 2005

The responsibilities of the VOS Climate project management team have now transferred to a new Task Team established to coordinate the projects development. Membership remains essentially the same, and includes representatives of all participating countries, the RTMC, the DAC, the GCC and the Scientific Advisers. Taking full account of the scientific assessment of project data, the Task Team will consider whether VOSClim should remain as a project, or whether it should be developed into a separate long-term operational programme, complementary to the VOS Programme.

Summary

Considerable time and effort has been expended by all the project contributors to ensure the success of VOSClim—which has the potential to enhance the quality of observations over the oceans, while also acting as a model for the wider VOS. As the project now enters its important 'evaluation phase' we hope to prove that this effort has been justified,

Although the essential project procedures are now in place, and the project can be considered as being 'operational,' there nevertheless remain some obstacles to overcome—the biggest priority being to increase the level of recruitment. The goal is to provide a representative subset of the wider VOS rather than to concentrate on ships with sophisticated instrumentation. If they have not already done so, Masters and observers reading this article are therefore encouraged to become involved in the project by contacting their nearest Port Met Officer and volunteering their ships to participate. The suitability of each prospective ship will be considered on its merits.

The impact of climate change is increasingly being brought to our attention, and has become a matter of global concern in recent years. If we are to have confidence in our climate analyses and model predictions we will need higher quality ship data. The VOSClim observation datasets, combined with the associated metadata, will play an important role in fulfilling this need.

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Hurricane Rita and the Buoys

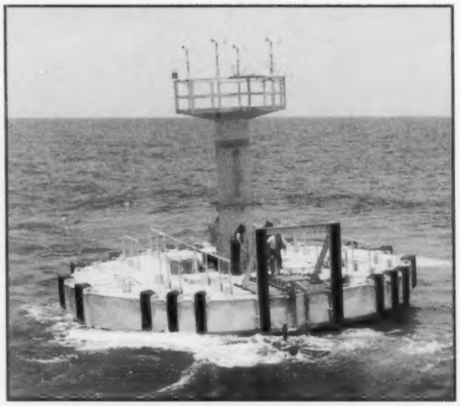
Reprinted with permission from http://www.weathersa.co.za/Pressroom/2005/2005Sep29HurricaneRita.jsp
Ian T. Hunter, South African Weather Service

Despite satellite-derived cloud imagery and even sea-surface wind data inferred from satellites, the weather information supplied by voluntary observing ships (VOS) is still invaluable to the marine forecaster.

However, if the approaching weather system is a hurricane (tropical cyclone/ cyclone/ typhoon - all the same thing, different regional names)—making 'valuable meteorological observations' becomes of secondary importance to the master of the ship!

Fortunately, in the Gulf of Mexico there is an offshore surface observing network which remains steadfast in the face of the storm. These are the moored buoys of the National Data Buoy Center (NDBC).

The attached photo is an example of one of NBDC's 10 meter discus buoys. A similar buoy was situated close to the path of Hurricane Rita as she headed across the Gulf of Mexico in the direction of Galveston last Thursday. The maximum 10-minute average wind speed was 87 kt (161 km/hr) at 0030 UTC September 23, with a peak gust of 118 kt (220 km/hr) at 0021 UTC 23 September. Sea state also reached its maximum in the late afternoon—12 m (significant wave height—individual waves could have been 50% higher or more).



The cost of maintaining even one of the smaller, 3m discus buoys at sea is considerable. Fortunately the major maintenance cost—i.e. ship time—is carried by the US Coast Guard.

Notes

Dr. Ed Rappaport, Deputy Director of the Tropical Prediction Center, NOAA/NWS, Miami, Florida

Tropical cyclones, the generic name for tropical depressions, tropical storms and hurricanes, spend most of their life cycles over open waters as immediate threats to mariners including Department of Defense personnel and assets, U.S. and international shipping and recreational interests, and subsequently to the many peoples and properties exposed to their forces at landfall and then inland. Surface weather observations over these vast waters are extremely sparse, limited to a few island stations and an occasional ship report. Reconnaissance aircraft fill some of this void, but this resource is generally available in limited numbers and areas, and can require about a day of lead time. Satellite-based observations can provide remote estimates of surface conditions, but are not yet reliable in areas of heavy rain, where information is often of greatest need.

A network of offshore buoys with wind, pressure, ocean wave and subsurface instrumentation helps the National Hurricane Center more accurately determine the following for its national and international analysis and forecast responsibilities:

1. When a tropical cyclone has formed or dissipated.

2. The extent of a tropical cyclone's wind circulation. This is important to forecasting wind speed and storm surge, for proper sizing of "watches" and "warnings" and for decisions on preparedness, including evacuation.

3. The location of the center of tropical cyclones, which is important to making track forecasts.

4. The height and distribution of ocean waves generated by tropical cyclones, which is critical to mariners.

5. The maximum intensity of tropical cyclones. This is important to preparedness, including evacuation decisions, and to mariners through the generation of dangerous waves.

6. The quality of the measurements and estimates obtained from remote-sensing reconnaissance aircraft and satellites.

Shipwreck: Prins Willem V.

by Skip Gillham, Vineland, Ontario, Canada

From 1937 to 1972 the vessels of the Dutch flag "Oranje Line" were well known around the Great Lakes save for the World War Two years. Officially known as Maaschappij Zeetransport N.V., the firm was one of the first to provide regular liner service to Great Lakes ports.

Oranje had five ships dedicated to the inland trade when World War Two broke out in 1939. Only two of their vessels were still afloat when hostilities ceased in 1945. Their freighters had been ideal for trading through the old, pre-Seaway, St. Lawrence canals. Similar new tonnage was needed as the St. Lawrence Seaway was still only a dream and it would not be completed until 1959. One of the postwar additions to the Oranje Line remained inland due to an unfortunate accident.

The construction of the **Prins Willem V**. began at Hardinxveld, Netherlands, in 1940 and the ship was intended for Great Lakes trading. The vessel was not yet completed when the German occupation commenced so the hull was scuttled by the Dutch Navy at Rotterdam to impede the advancing forces.

Water and mud were pumped out of the hull in 1945 and it was refloated and completed. Service began in January 1949 and **Prins Willem V**. stopped at Eastern Canadian ports when ice clogged passage to the Great Lakes. The ship is shown on the St. Lawrence in a photo by Daniel C. McCormick.

The 1,567 gross ton **Prins Willem V**. made about five trips per year to freshwater ports but was lost in a collision on Lake Michigan, off Milwaukee, Wisconsin, on October 14, 1954. The tug **Sinclair Chicago** and barge **Sinclair XII** punched a 20-foot by 8-foot hole in the starboard side of the Dutch freighter, and **Prins Willem V**. was doomed.

Efforts to rescue the thirty sailors on board were successful but attempts to save the ship were not. Plans to refloat the hull were soon under consideration but never developed. The ship was abandoned but not forgotten. An idea to refloat the hull in 1965 and use it to store and demonstrate fire-fighting equipment was considered but not pursued. Eventually an out of court settlement was reached and the owners were awarded $200,000.

Divers have found the underwater remains of the ship to be an attraction but apparently at least four have drowned in their attempts to visit **Prins Willem V**. In October 1997 one diver got tangled in a guy wire over the engineroom and perished.

Oranje built a second **Prins Willem V**. in 1956 and this vessel served the company well. It was sailing as **Araxos**, a sixth name, when damaged by a fire on May 21, 1979. Repair cost could not be justified, and this freighter was broken up for scrap at Durban, South Africa, in the fall of 1981.

Cape of Storms—August 2005

Ian T. Hunter, South African Weather Service

During the period 18–21 August 2005, a very intense vortex was located south-east of South Georgia in the Southern Atlantic Ocean, with the pressure recorded by 2 drifting buoys dropping below 940 hPa. The fact that the low was semi-stationary increased the duration factor associated with the wave generation, and in the next 4–5 days, these waves traveled almost 3000 nmi to reach the Cape of Good Hope by Friday evening, 26 August. They arrived in the form of a long-period swell with peak energy period (Tp) in excess of 18s (ex Slangkop Waverider buoy, offshore Cape Town).

To complicate matters another deep vortex formed in the interim, much closer to Cape Town on 24 August. This second low was associated with an upper cut-off low and thus also moved very slowly relative to the speed of a normal mid-latitude frontal trough. Thus in this case the duration factor for wave generation was also increased. A rough calculation indicates that both wave components would arrive off Cape Town at approximately the same time. The result was a significant wave height of 10 m (33 ft)—by far the highest since the start of the winter—at around 8 pm.

It is a well-known phenomenon in False Bay (on the eastern side of the Cape Peninsula) for long-period swell to be refracted and focused onto certain parts of the coastline. This is particularly the case at the small fishing harbour of Kalk Bay. The harbour master had the foresight to send the trawlers along to the safer haven of Simonstown. However two tourists inexplicably decided to take a stroll along the breakwater and both ended up in the sea. Fortunately both were rescued.

Long Southern Ocean swell refracted/focussed into False Bay, South Africa

Photo courtesy of False Bay Echo

Despite being on a major trade route, VOS reports off the Southern African coast tend to be very sparse at times. Thus in the preamble to every Coastal and Deep Seas Bulletin, the South African Weather Service calls upon vessels to report unexpected, extreme conditions via Cape Town Radio. This has had a very good response. The tanker **Theano** (SZTD) sent through a plain text report early on Saturday morning from a position just west of Cape Agulhas—wind north-west 60 to 70 kts, swell (estimated) up to 10 m (33 ft). Compare this with the 0600 UTC land-based observation from Cape Agulhas—north-west 10 kts!—and the value of offshore wind observations should become abundantly clear.

At 1200 UTC on Saturday 27 August, a formal VOS report was received from the container vessel **Safmarine Agulhas** (ELSM9) just south of Cape St Francis. Swell was estimated at 12 m (40 ft) with a 25s period. This period does appear to be a bit high, but swell period is generally estimated too low, so the observer was at least witnessing an unusually long swell component. Furthermore the swell had traveled a long distance (high frequencies lost) and (accelerometer-based) Waverider buoys are unable to measure swells longer than ~ 20 sec accurately.

At the FA gas production platform some 120 nmi to the east, the wave height peaked at around 10 m during the night. Unfortunately the radar sensor was giving spurious values.

Surprisingly, no major problems were reported by vessels at sea during this storm. The previous week there were 3 crew from two different ships crossing the Agulhas Bank who had to be helivac'd to shore following injuries relating to an earlier storm. Yet the associated sea conditions were by no means as extreme as those described above. Sadly, one of the two vessels also lost a crew member overboard.

Further up the coast, just to the south of East London, the ongoing attempt to salvage the cargo of West African timber from the stranded Kiperousa was also adversely affected by the heavy swell moving up the coast. She had already been declared a total loss following several attempts to refloat her after she grounded on 7 June. The long-period wave component peaked at 5 am on Sunday 28 August.

Note 1. In October 1999 a log carrier, the **Sanaga** sank south of Madagascar spilling her cargo of huge 20 ton logs into the ocean. These logs presented a major navigation hazard to smaller vessels as they floated down the east coast, beaching at various places all the way between Inhambane (Mozambique) and False Bay (over 1200 nmi)

Note 2. SAWS is grateful to the National Ports Authority of South Africa for making their Cape Town Waverider data available via Environmentek (CSIR)

Grounded M/V *Kiperosa*—salvage tug *Nicolay Chiker* in attendance.

Photo Daily Despatch, East London

MARAD Ships Help in Hurricane Recovery

Reprinted with permission from http://www.marad.dot.gov/katrina/ShipsMobilized_Katrina.html
Photos courtesy of Paula Campbell, Port Meteorological Officer, New Orleans, Louisiana

Eight ships from MARAD's National Defense Reserve Fleet are serving in the national effort to recover from Hurricane Katrina. Two Ready Reserve Force ships have stood firm in New Orleans, their home port. The **Cape Kennedy** has provided office space for the operations of the Port of New Orleans; the **Cape Knox** has supported that effort, and is now fully crewed and ready to sail to support cleanup efforts. Three state maritime academy training ships will provide housing and support for port workers and petroleum industry workers, and three more Ready Reserve Force ships will provide their unique capabilities to underpin the area's economic recovery.

Training Ship *Sirius* with Crane Ship *Diamond State* Astern

The crane ship **Diamond State** is in New Orleans, lending its capabilities to help restore port operations there; the crane ship **Equality State** will sail on Tuesday for Gulfport, MS, to help restore port operations there. The Ready Reserve Force ship **Wright** is heading to New Orleans from Baltimore. The **Wright** is a helicopter repair ship, which can provide support for offshore helicopter activity and house more than 325 people.

Training Ship *Empire State* at Conoco-Phillips Refinery in Belle Chase LA

The Training Ship **Sirius** has arrived in New Orleans from the Texas Maritime Academy in Galveston; the **Sirius** is serving as accommodation and offices for personnel. The Training Ship **Empire State** has been sent from the State University of New York Maritime Academy to provide accommodation and offices to help get the Conoco-Phillips refinery in Belle Chase, LA, up and running again. The Training Ship **State of Maine** is on its way from the Maine Maritime Academy in Castine, ME, also to provide living and office space.

The Ready Reserve Force is a fleet of militarily useful ships, usually used to support the U.S. Armed Forces in time of war or national emergency. Many of the ships from the RRF have been back and forth to the Middle East, supporting armed forces there. RRF ships have frequently been activated to help in recovery efforts from disasters overseas, but this is the first time they have been activated to assist in recovery from a domestic disaster. "The Maritime Administration is working day and night to get these vessels successfully deployed," said Acting Maritime Administrator John Jamian. "What we, and the men and women of the U.S. Merchant Marine, do best is support this nation in time of peace and war." All RRF ships are crewed by U.S. civilian merchant mariners. MARAD also provides training ships for all six state maritime academies; the RRF ships and training ships are all part of the National Defense Reserve Fleet, which MARAD runs.

The Training Ship State of Maine

This deployment also marks the first time that a Secretary of Transportation requested release of RRF vessels by the Department of Defense. In announcing the request on Saturday, September 3, Secretary of Transportation Norman Y. Mineta said, "We need now to mobilize resources like these ships that can support what is going to be a long-term commitment to rebuilding the region

From The Desk of a PMO

Rich Courtney, Port Meteorological Officer, Kodiak, Alaska

G'day…Rich, your PMO in Kodiak, Alaska here. The VOS program efforts in Alaska center on taking advantage of the numerous coastal craft to supply weather observations, for forecast verification and updates. There are three types of vessels providing the bulk of ship observation collection efforts. These are tug & barge operations, ferries and fishing boats.

Tug & barge operations center on the supply of fuel products and hauling cargo to most of the Alaskan coastal communities from Prudhoe Bay, on the North Slope, to Ketchikan in southeast Alaska. Late spring and summer starts the push of the re-supply effort. With the arrival of fall, things are winding down in the re-supply effort. Stronger seasonal storms and severe superstructure icing limit movement and winter stops all efforts for these crews north of Bristol Bay. Honors go to Sea Coast towing tugs **Pacific Raven**, (WDB7583) with over 1600 observations and **Pacific Challenger**, (WDA3588) with close to 1100 observations.

Ferries run throughout the year, principally from Bellingham Washington to Haines, Alaska. A second arm runs from Cordova to Whittier and Homer to Kodiak. Weather sensitive, the ferries rely upon the coastal waters forecasts to accurately plan their trips and minimize the effects upon passengers and vehicles. Plying the inner channel areas these observations are critical to forecasting the strong wind events that accompany the oceanic storms in the winter. Our top reporter in this area is Alaska Marine Highway ferry **Tustumena**, (WNGW) with 350 observations, mostly reported by e-mail.

Alaska Marine Highway Ferry *Tustemena*
Image courtesy of Alaska Department of Transportation

Finally, fishing vessels have made a significant contribution throughout the year by reporting their at sea conditions. These hearty crafts and their crews spend as little as 24 hours at sea, to four weeks plying the close in waters and out into the Bering Sea. Weather conditions impact on whether a vessel can deploy or retrieve trawls, long lines, or pots for a variety of fish and crab species. As of the end of October, fishing vessel **Alaskan Leader**, (WDB7918) has contributed over 325 weather observations, most of which are located in the fertile fishing grounds of the Eastern Bering Sea.

The National Weather Service uses a variety of methods to collect weather observations. In addition to using GMDSS and Sat-C, we train crews to report weather observations via e-mail, HF/SSB radio and satellite telephone. Most of our tugs report the synoptic coded weather observations via e-mail to an e-mail address in the Alaskan Region Headquarters. These observations are then forwarded to the NWS Telecommunications Gateway for ingestion and dissemination to a variety of foreign and domestic users. The second and third methods rely on voice to collect the information. Calls, via HF/SSB can be made on 4125 kHz to any of seven weather offices, performing a continuous weather watch. With offices in Barrow, Nome, King Salmon, Kodiak, Yakutat, Cold Bay & Annette Island, NWS staffs collect the information and encode the observations for transmission using a piece of software designed by the Alaska Region. With the price of satellite communications beginning to decrease significantly, the Valdez Office uses a satellite phone to receive the observations, encode them and transmit them to the Telecomm gateway. This system uses a flat fee cost to allow unlimited voice access to the NWS. Fishing vessels and suitably equipped tugs can easily talk with NWS personnel about impending forecasts and supply an observation to verify the accuracy of a forecast in their area.

The *Alaskan Leader*
Image courtesy of Alaskan Leader Fisheries, Inc.

With the largest coast line in the US, meteorologists have a difficult job tracking weather. Thankfully, many of the mariners from merchant marine to fishing vessels have stepped up to the plate with their local conditions to help decipher the oceanic weather puzzle.

Marine Weather Review—North Atlantic Area May through August 2005

By George P. Bancroft, NOAA National Center for Environmental Prediction

Introduction

The period started out with a pattern more typical of late winter, with the month of May featuring two significant coastal storms off the U.S. East Coast and another slow-moving storm forming early in the month in the southeast high seas waters. The period from June through August featured a more summerlike pattern with most of the significant non-tropical cyclonic activity north of 50N. In a preview of fall two hurricane-force non-tropical cyclones developed in the northeast Atlantic late in August.

In what is turning out to be a very active North Atlantic hurricane season, twelve named cyclones formed during the four-month period, with four of these moving through or directly affecting Ocean Prediction Center's (OPC's) marine area of responsibility. One of these attained hurricane strength in OPC's waters north of 31N and later redeveloped into a powerful extratropical storm near Greenland.

Tropical Activity

Tropical Storm Franklin: Franklin formed south of OPC's marine area late in July and became the first tropical cyclone of the season to directly affect OPC's area. The cyclone entered OPC's waters near 31N 68W with maximum sustained winds of 35 kts with gusts to 45 kts early on July 26. Franklin then moved slowly north before turning more northeast and accelerating on the 28th around the periphery of the subtropical ridge, attaining a maximum strength while passing 300 nmi northwest of Bermuda on the afternoon of the 28th, with maximum sustained winds of 50 kts and gusts to 60 kts. This was followed by a slow weakening trend as the system accelerated northeast. The **Alkin Kalakvan** (V7GY3 near 41N 58W) reported a southwest wind of 50 kts at 2100 UTC July 29 as Franklin's center passed to the north. The Canadian buoy 44141 (43.0N 58.0W) reported a southeast wind of 31 kts and gusts to 39 kts at that time, along with 2.0 m seas (7 ft) which peaked at 5.5 m (18 ft) two hours later. Another buoy to the east, 44138 (44.3N 53.6W), reported southeast winds of 27 kts with gusts to 43 kts and 2.0 m seas (7 ft) at 0600 UTC July 30, and maximum seas of 4.5 m (15 ft) three hours later. Franklin became an extratropical gale-force low while passing 200 nmi south of the island of Newfoundland late on the 29th, and then became absorbed by a larger low in the Labrador Sea early on July 31.

Tropical Storm Harvey: Harvey entered OPC's waters near the same location as Franklin's entry point, as a minimal tropical storm at mid-day on August 3, with maximum sustained winds 35 kts with gusts to 45 kts. ***Figure 1*** shows Harvey passing near Bermuda at 1200 UTC on the 4th when the cyclone developed a maximum intensity of 55 kts sustained with gusts to 65 kts as of the 1500 UTC TPC advisory time. Harvey then weakened only slightly before turning northeast along an approaching front (second part of ***Figure 1***). A scatterometer overpass (***Figure 2***) about nine hours later reveals a tight circulation with strongest winds close to the center (33.5N 57W), characteristic of tropical cyclones. Winds of 50 kts are shown just north and northeast of the center along with some 60 kts barbs that appear to be rain-contaminated. Harvey became extratropical late on August 8 near 41N 45W. ***Figure 3*** shows the former Harvey as an extratropical gale near 41N 43W at 0600 UTC on the 9th, re-intensifying into a storm twenty-four hours later. The 994 hPa central pressure of the storm was based on a drifting buoy report (62935 at 44.73N 34.80W) of 994.2 hPa at 0520 UTC on the 10th. Quikscat data is available, not shown here but having similarity to ***Figure 2*** with its compact circulation, except that the stronger winds (50–55 kts) were just south and southeast of the center. The storm then began a weakening trend on the 10th, before turning southeast and becoming stationary near 41N 32W by the 12th.

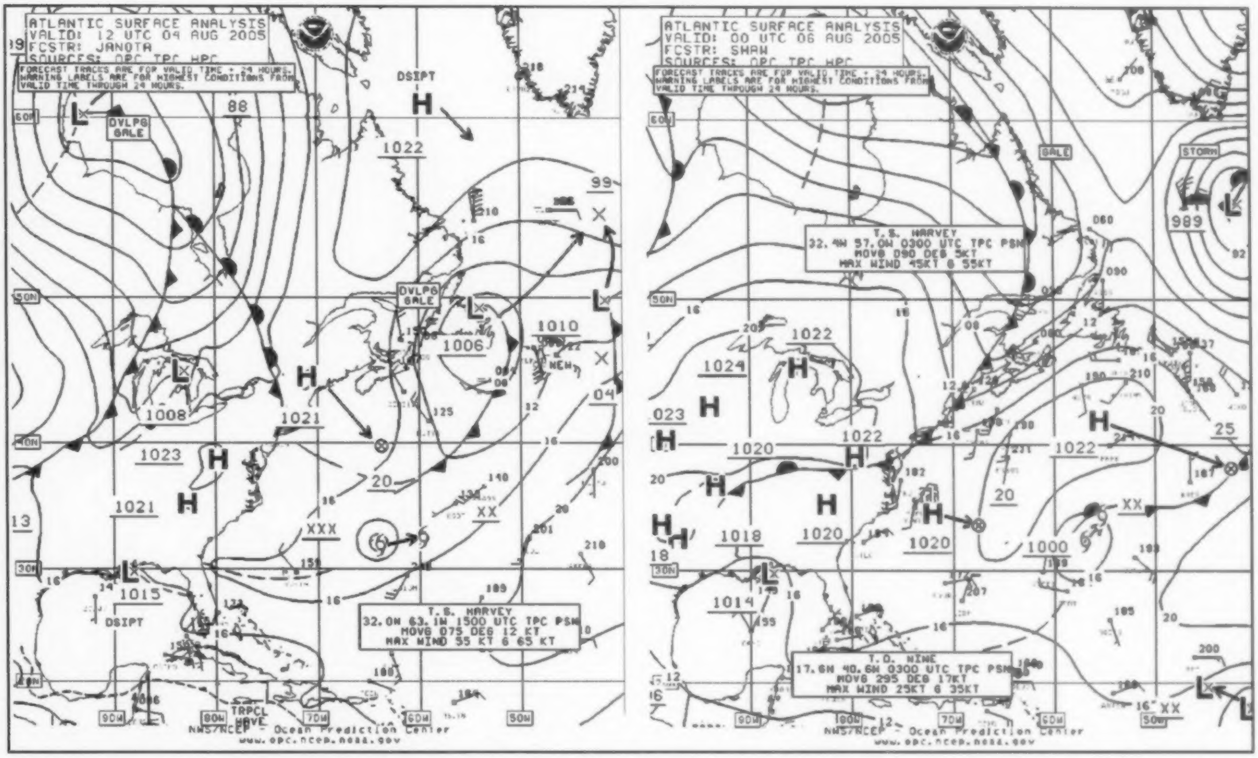


Figure 1.–OPC North Atlantic Surface Analysis charts (Part 2 - west) valid 1200 UTC August 4 and 0000 UTC August 6, 2005, showing Tropical Storm Harvey and the development of a North Atlantic storm northeast of Newfoundland.

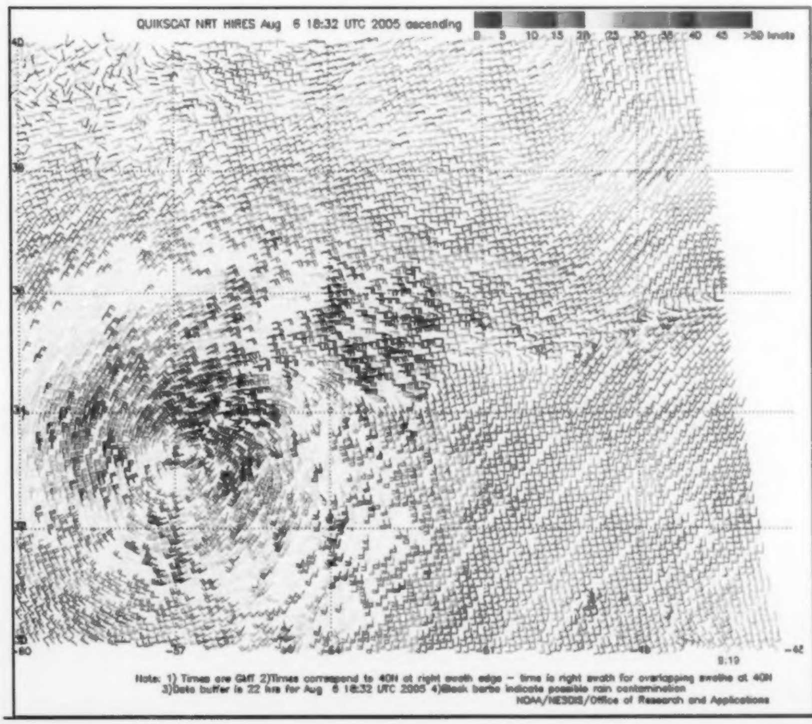


Figure 2.–High-resolution QuikScat scatterometer image of satellite-sensed winds valid at 0919 UTC August 6, 2005. The resolution of the image is 12.5 km, versus 25 km for the coarser-resolution version of the imagery. The valid time of the pass is about 9 hours later than that of the second part of *Figure 1.*

Image is courtesy of NOAA/NESDIS/Office of Research and Applications.

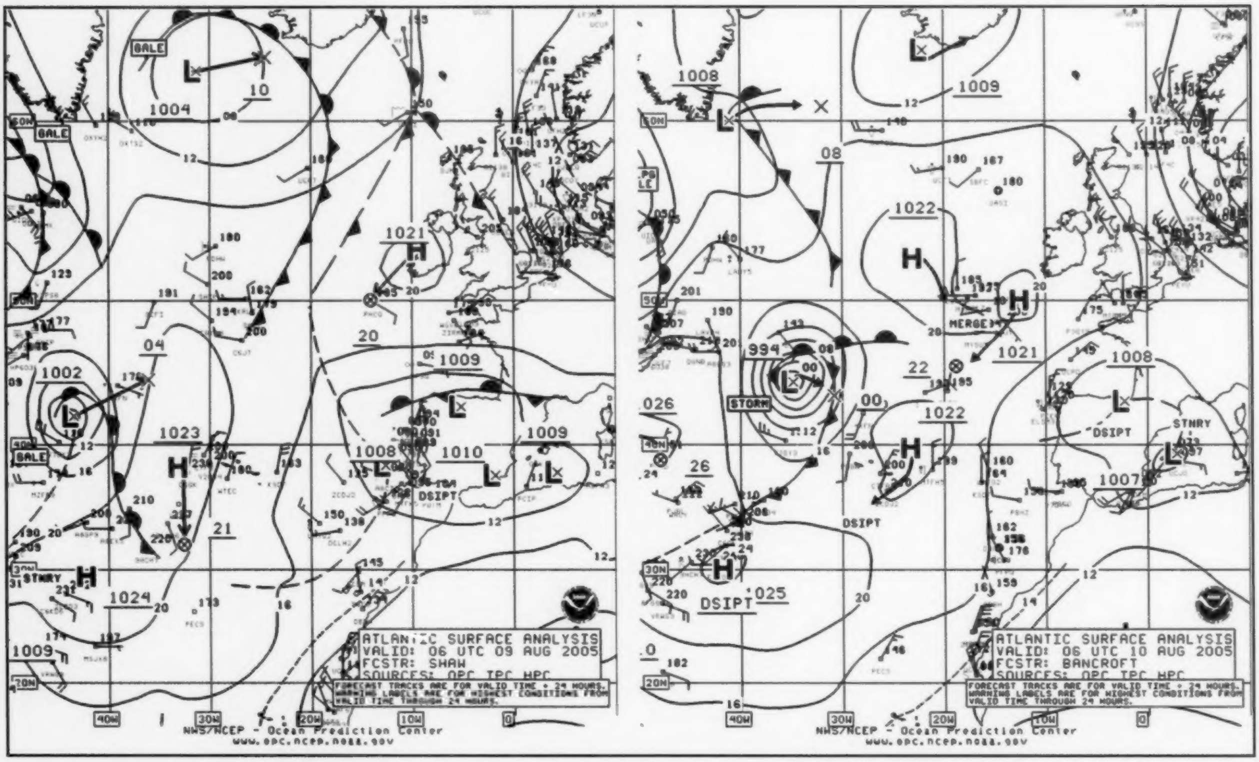


Figure 3.–OPC North Atlantic Surface Analysis charts (Part 1 - east) valid 0600 UTC August 9 and 10, 2005.

Hurricane Irene: Irene developed from Tropical Depression Nine, which appears well south of OPC's marine area in second part of ***Figure 1***, and crossed 31N near 69W late on August 13 as a strong tropical storm, with maximum sustained winds of 60 kts with gusts to 75 kts. Irene strengthened into a hurricane late on the 14th while passing near 35N 69W, with maximum sustained winds 70 kts with gusts to 85 kts. The cyclone then turned more east between 36N and 37N from the 15th into the 17th of August as a cold front approached from the north, attaining a maximum intensity of 85 kts sustained with gusts to 105 kts near 36.5N 61.6W at 2100 UTC on the 16th. This made it a Category 2 hurricane on the Saffir-Simpson scale[1]. Irene then began to weaken while accelerating northeast, losing tropical characteristics late on the 18th while passing east of Newfoundland. At 1100 UTC August 18, the **Maersk Naples** (A8FI4) (38N 51.5W) reported a southwest wind of 40 kts and 3.0 m seas (10 ft). Seven hours later the **Maveric** (PFWZ) encountered south winds of 35 kts and 8.5 m seas (28 ft) near 47N 42W. ***Figure 4*** shows Irene as a tropical storm in the first part of the figure, becoming a powerful extratropical storm near Greenland thirty-six hours later. ***Figure 5*** is a morning visible satellite image showing Irene as the separate somewhat circular cloud mass east of the cold frontal cloud band that lies off Newfoundland. The western edge of Irene's cloud mass can be seen casting a shadow on the lower frontal clouds to the west in this high-resolution image. The high-resolution quikscat image of ***Figure 6*** shows the winds around extratropical storm Irene, in an area that often has little or no ship data. Wind barbs in the 50 to 75 kts range appear around the south side of the storm. The cyclone was at maximum intensity (964 hPa) at that time. The system then stalled and weakened between Greenland and Iceland, before becoming absorbed by another low near Iceland late on August 22.

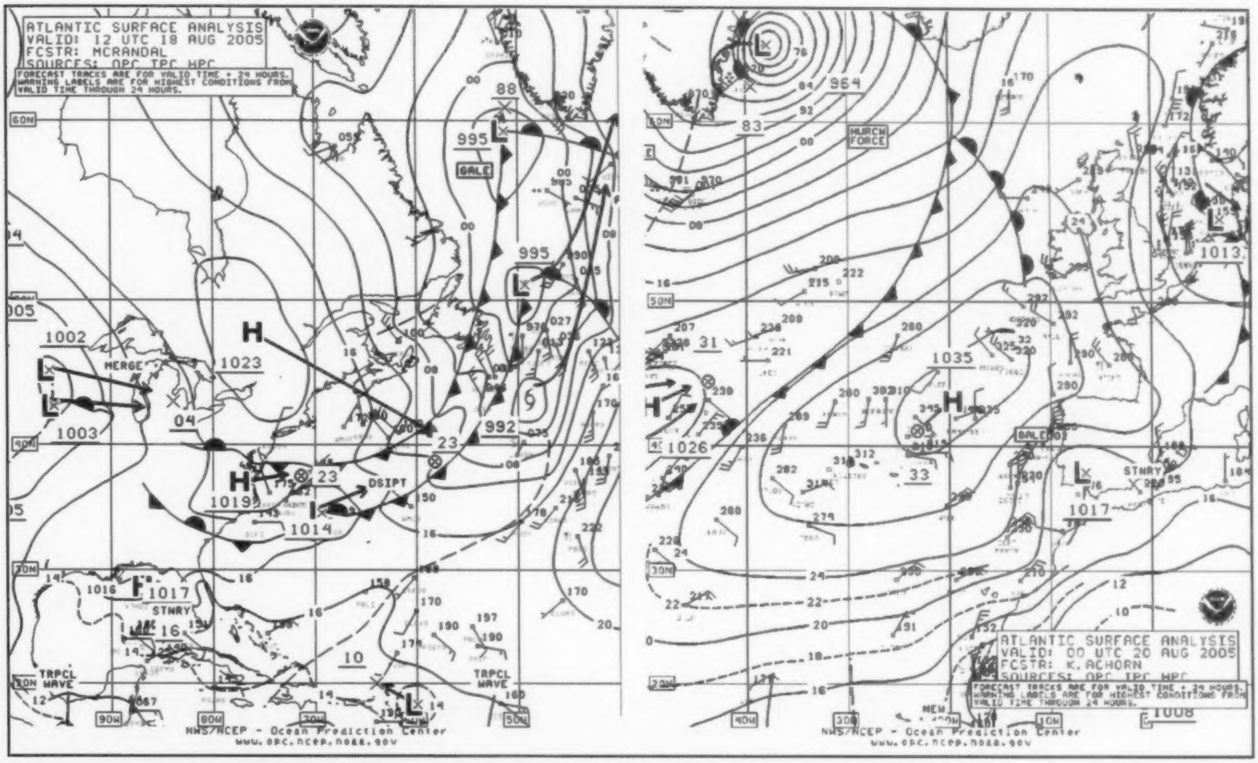


Figure 4.–OPC North Atlantic Surface Analysis charts valid 1200 UTC August 18 (Part 2) and 0000 UTC August 20, 2005 (Part 1). Tropical Storm Irene is shown becoming an extratropical hurricane-force storm.

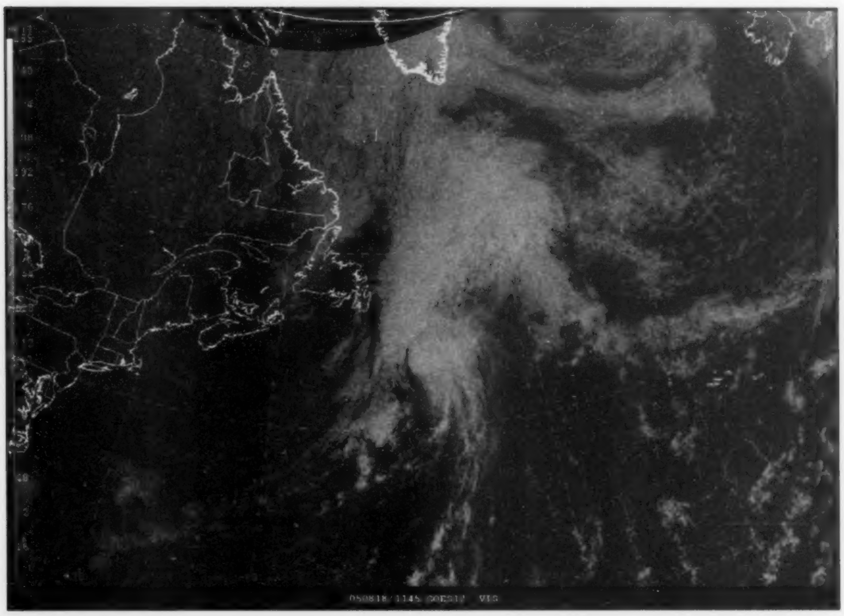


Figure 5.–GOES-12 visible satellite image valid at 1145 UTC August 18, 2005. The valid time is approximately that of the first part of *Figure 4*.

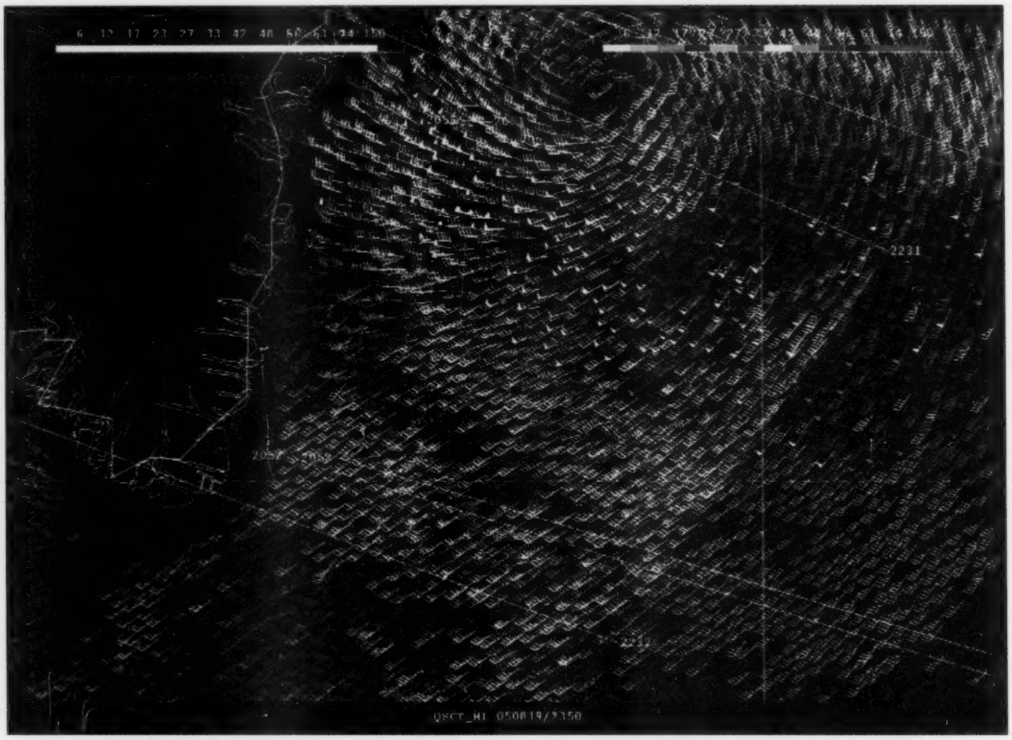


Figure 6.–High-resolution QuikScat scatterometer image of satellite-sensed winds valid at about 2231 UTC August 19, 2005. The valid time of the pass is about one and one-half hours prior to that of the second part of *Figure 4*. The numbered diagonal lines are satellite cross-track time lines.
Image is courtesy of NOAA/NESDIS/ Office of Research and Applications.

Tropical Storm Lee: Tropical Depression Thirteen formed near 29N 50W early on August 31 and briefly became Tropical Storm Lee while approaching OPC's marine area near 30.5N 50W at 2100 UTC August 31, with maximum sustained winds of 35 kts with gusts to 45 kts. Lee then weakened to a tropical depression six hours later while drifting north into OPC's waters, and losing tropical characteristics later on September 1.

Other Significant Events of the Period

Southeastern Storm, May 4–5: This compact storm formed in the subtropics about 500 nmi southwest of the Azores from the merger of two non-tropical lows as shown in ***Figure 7***. Although the lowest central pressure was only 998 hPa, the cyclone formed in an environment of high pressure and winds around the north and west sides reached storm force by the 4th, as revealed in the scatterometer winds of ***Figure 8***. There are even a few 60 kts barbs on the north side of the well-defined storm center near 30.5N 34W. At 1800 UTC May 4 the **CP Performer** (ZCBD4) (33N 32W) reported east winds of 40 kts. Blocked by the large area of high pressure to the north, the cyclone began a northeastward drift on the 5th and weakened to a gale, before merging with another low moving southeast from the Grand Banks early on the 8th.

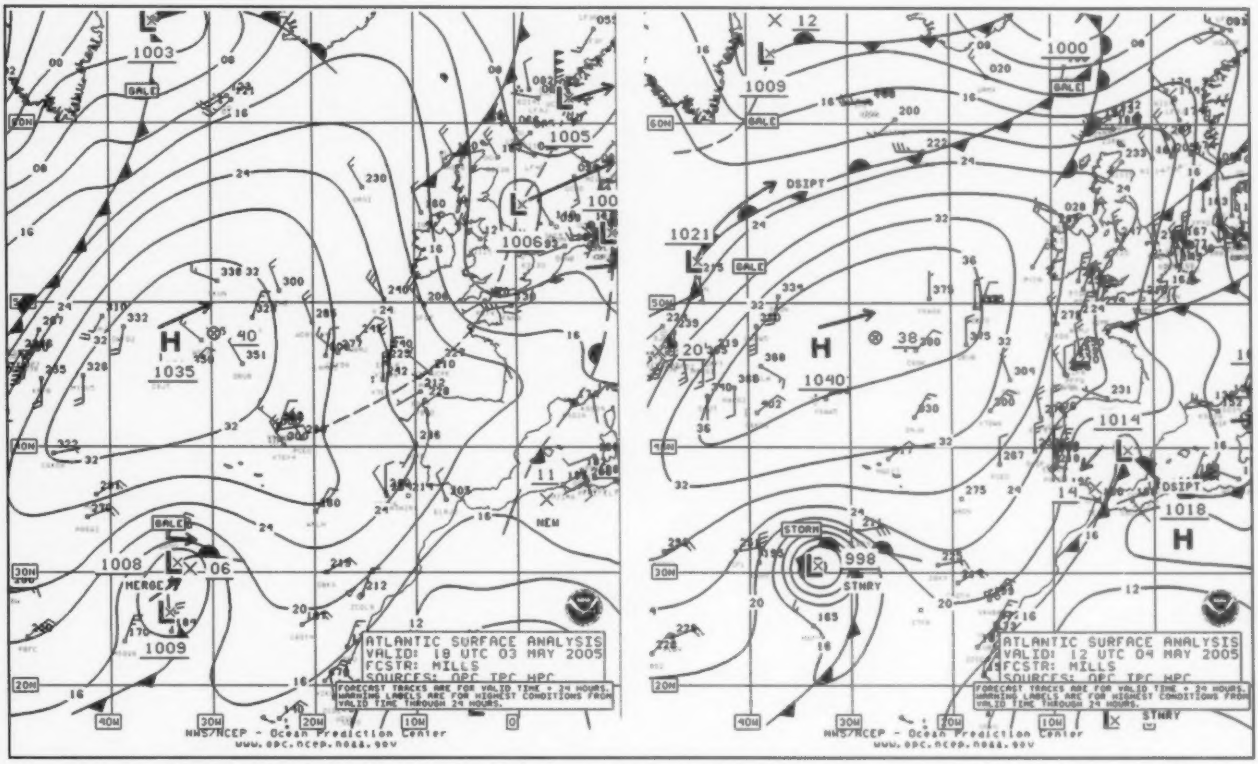


Figure 7.–OPC North Atlantic Surface Analysis charts (Part 1) valid 1800 UTC May 3 and 1200 UTC May 4, 2005.

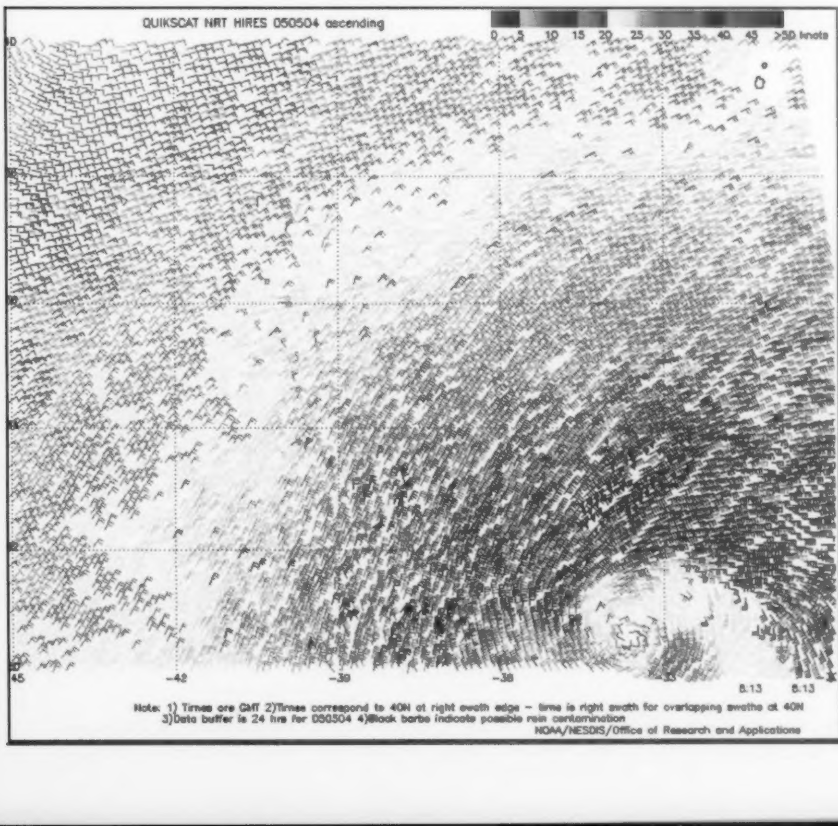


Figure 8.–High-resolution QuikScat scatterometer image of satellite-sensed winds valid at about 0813 UTC May 4, 2005. The valid time of the pass is about four hours prior to the valid time of the second part of *Figure* 7. *Image is courtesy of NOAA/NESDIS/Office of Research and Applications.*

Coastal Storm, May 5–7: A frontal wave of low pressure moved out of the Gulf of Mexico early on May 5 and intensified to a storm near the North Carolina coast on the morning of the 6th. ***Figure 9*** shows the system becoming fully developed off the mid-Atlantic coast by early on the 7th. Most of the stronger wind reports and highest seas came during the period covered by ***Figure 9***. ***Table 1*** contains a list of ship, buoy and coastal C-MAN observations taken during the storm. The system, blocked by the ridge to the east and northeast, weakened to a gale and began a southeastward motion after reaching Georges Bank early on the 8th. The gale center then passed well south of Newfoundland on the 11th before turning north and becoming absorbed by another low near Newfoundland on May 13.

North Atlantic Storm, May 6–7: This storm developed at the same time as the aforementioned coastal storm. ***Figure 9*** shows it developing from a frontal wave of low pressure southeast of Newfoundland, moving northeast and quickly spinning up into a storm before looping southeast, blocked by high pressure to the north. **Platform** (VEP717) in the Grand Banks reported a northwest wind of 60 kts at 1200 UTC on May 7. The cyclone then headed southeast as a gale before turning east over the eastern Atlantic and dissipating near Portugal on the 11th.

Coastal Storm, May 25–26: A series of low-pressure centers moved off the mid-Atlantic coast late in May and looped near or over the southern New England offshore waters before heading east, with the strongest of these developing storm-force winds mainly in the southern New England waters on the 25th. The area of gale to storm-

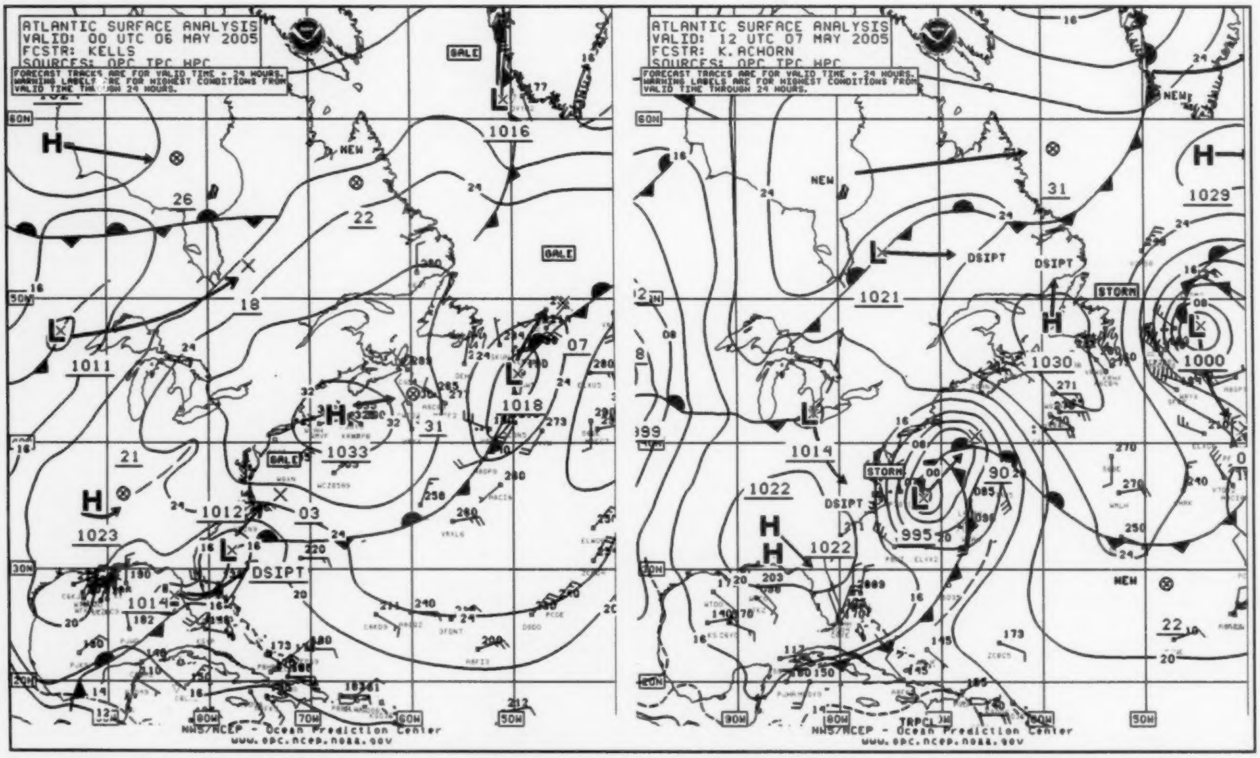


Figure 9.–OPC North Atlantic Surface Analysis charts (Part 2) valid 0000 UTC May 6 and 1200 UTC May 7, 2005.

OBSERVATION	POSITION	DATE/TIME(UTC)	WIND	SEAS(m/ft)
Montebello (DGZN)	37N 73W	06/1800	NE 55	
State of Maine (WCAH)	37N 69W	06/1800	SE 50	6.0/19
Sumida (3FMX7)	36N 73W	06/2000	S 35	8.0/26
UBC Saiki (P3GY9)	36N 74W	07/1200	N 40	6.5/22
Lykes Explorer (WGLA)	36N 68W	08/0000	W 35	8.0/27
Luzon Strait (PBHT)	34N 74W	08/0000	NW 35	9.5/31
Buoy 41004	32.5N 79.1W	05/2100	N 37 G47	3.5/11
		05/2200	maximum	4.0/13
Buoy 41002	32.3N 75.4W	05/2300	E 31 G39	3.5/11
		06/0000	peak gust 43	
		07/0200	maximum	5.5/18
Buoy 41025	35.0N 75.4W	06/2100	N 43 G 52	5.0/16
			Peak 60	
		06/1900	maximum	6.0/20
Buoy 41001	34.5N 73.4W	07/1300	NW 37 G47	6.5/21
		07/1400	maximum	7.0/23
Buoy 44014	36.6N 74.8W	07/0600	N 35 G43	5.5/18
			Peak 47	
Buoy 44004	38.5N 70.5W	07/2100	NW 35 G47	4.5/15
Buoy 44017	40.7N 72.0W	07/0900	N 29 G37	3.5/11
		07/1200	Maximum	4.0/13
Buoy 44025	40.3N 73.2W	07/0800	NE 29 G37	3.0/10
		07/0900	Maximum	3.5/11
Buoy 44013	42.4N 70.7W	07/1500	NE 33 G43	4.0/13
		07/2100	Peak 47	
		07/1900	Maximum	5.5/18
Duck Pier (DUCN7)	36.2N 75.7W	07/0000	N 41G51	
Cape Lookout (CLKN7)	34.6N 76.4W	07/0000	N 46 G56 peak 62	
Buzzards Bay (BUZM3)	41.4N 70.9W	07/1700	N 45 G52 peak 54	
Isles of Shoals (IOSN3)	43.0N 70.5W	07/1600	NE 41 G46 peak 53	
Mount Desert Is. (MDRM1)	44.0N 68.0W	07/1900	NE 47 G52	
		07/2000	Peak 57	

Table 1.–Ship, buoy and coastal C/MAN station observations taken during coastal storm of May 5–7.

force winds was confined mainly to the north semicircle of the low. Quikscat data from about 2300 UTC on the 25th revealed uncontaminated winds to 50 kts in the New England waters south of 43N. The **Gypsum Baron** (ZCAN3) and the Ship (PTAG) reported north winds of 35 kts near 41N 70W and south winds of 35 kts near 40N 69W, respectively. After looping south of New England on the 26th, the cyclone headed north-east as a broad area of low pressure passing just south of Newfoundland on the 28th, before reaching the central Atlantic as a gale by the end of the month, and dissipating near Great Britain on June 4.

North Atlantic Storm, June 1–2: This storm formed from a frontal wave of low pressure about 180 nmi northwest of Bermuda at 0000 UTC June 1 and was much more progressive than the blocked systems of late May. A scatterometer pass revealed 50 kts winds around the center around 0000 UTC June 2 when the low passed near 38N 52W with a 1000 hPa central pressure. The **Zim Haifa** (4XIM) reported east winds of 40 kts near 42N 49W at 1200 UTC June 2. The system then followed its predecessor northeastward as a gale, before elongating and then dissipating near Great Britain on the 5th.

North Atlantic Storm, June 11–13: ***Figure 10*** shows a frontal wave of low pressure moving east from the island of Newfoundland and developing into a storm over a 36-hour period. High-latitude blocking caused it to stall near 50N 40W and then turn southwest and weaken to a gale on the 13th. A quikscat pass (***Figure 11***) reveals 50 kts northwest winds southwest of the center which is on the northern edge of the image. The **Queen Mary 2** (GBQM) reported northwest winds of 45 kts near 49N 41W at 1200 UTC on the 12th. The **Nuka Arctica** (OXYH2) encountered northeast winds of 50 kts near 59N 44W between the front and the tip of Greenland at 0600 UTC June 14. The cyclone was absorbed by another gale passing to the south and then east early on the 16th.

Northeast Atlantic Storm of July 2–4: This was unusual in its intensity at a time of year when such activity is usually at a minimum. ***Figure 12*** shows the rapid development of this storm over the twenty-four hour period ending at 0000 UTC July 3 when the central pressure bottomed out at 978 hPa. The quikscat image in ***Figure 13*** reveals a swath of wind in the 50 to 60 kts range west of Ireland

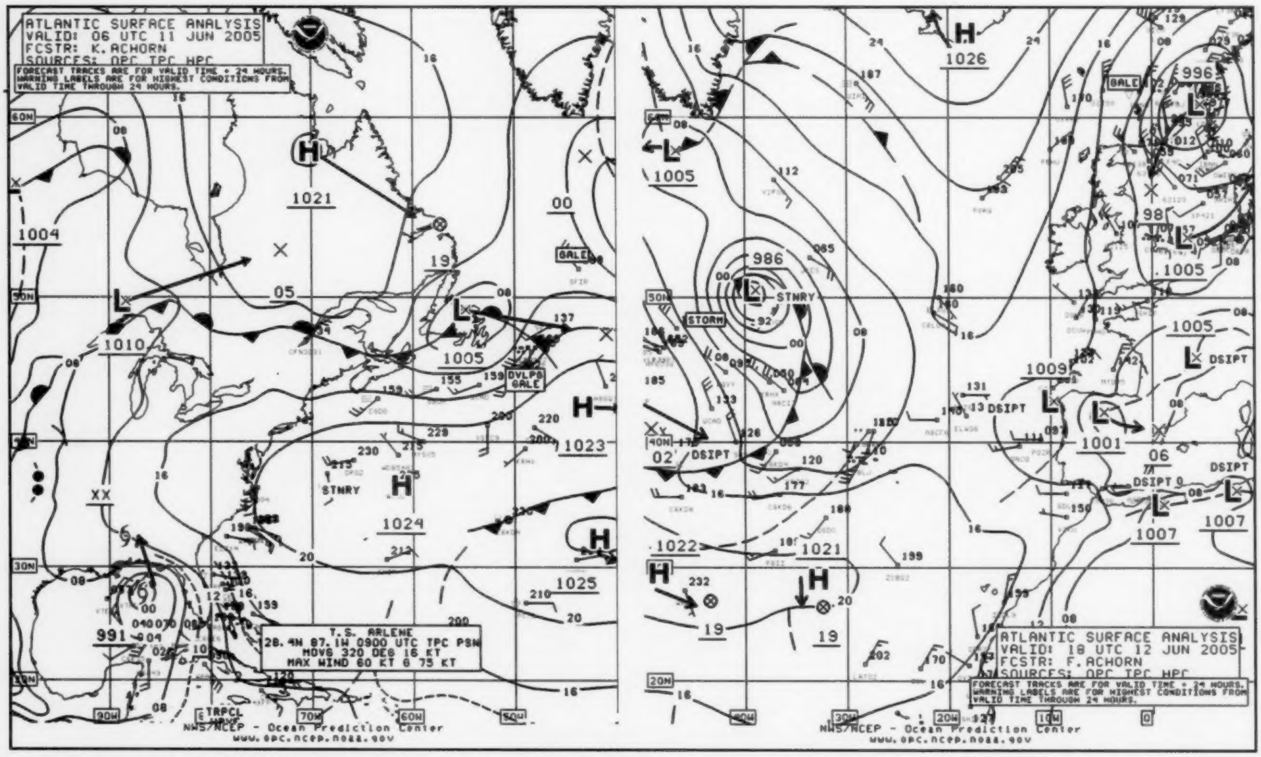


Figure 10.–OPC North Atlantic Surface Analysis charts: Part 2 (west) valid 0600 UTC June 11 and Part 1 (east) valid 1800 UTC June 12, 2005.

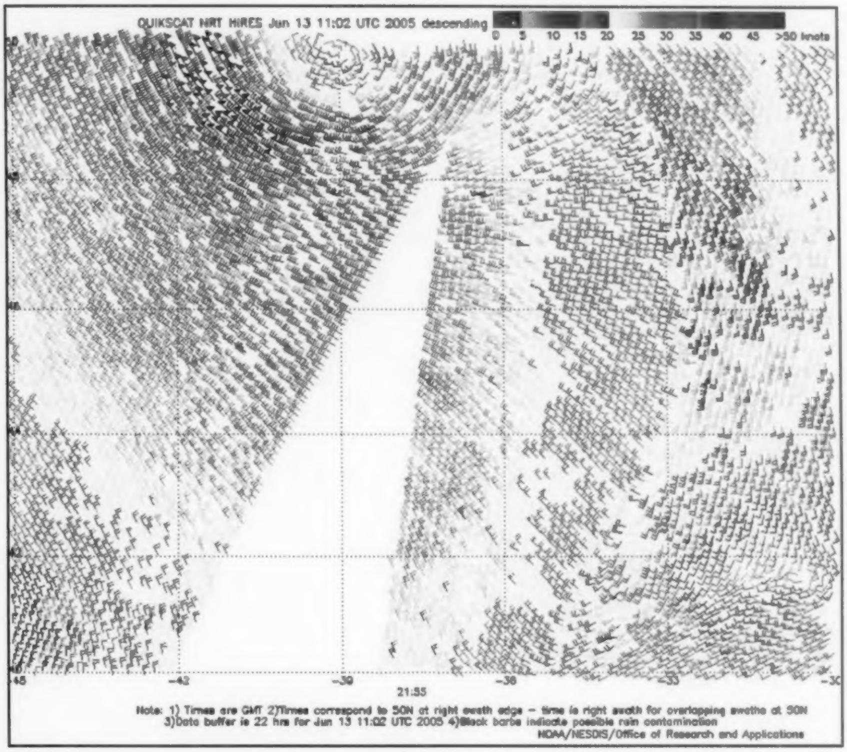


Figure 11.–High-resolution QuikScat scatterometer image of satellite-sensed winds valid at about 2155 UTC June 12, 2005. The valid time of the pass is about four hours later than the valid time of the second part of *Figure 10*. *Image is courtesy of NOAA/NESDIS/Office of Research and Applications.*

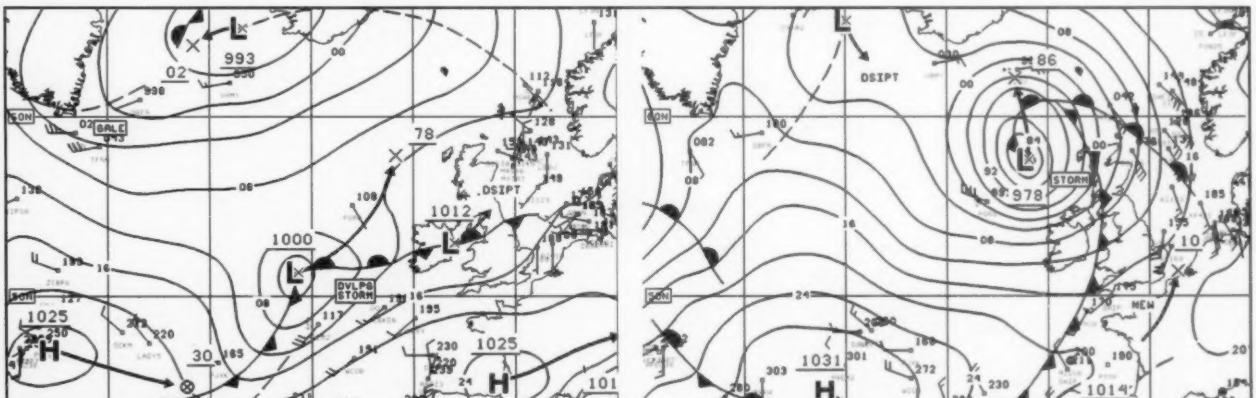


Figure 12.–OPC North Atlantic Surface Analysis charts (Part 1) valid 0000 UTC July 2 and 3, 2005.

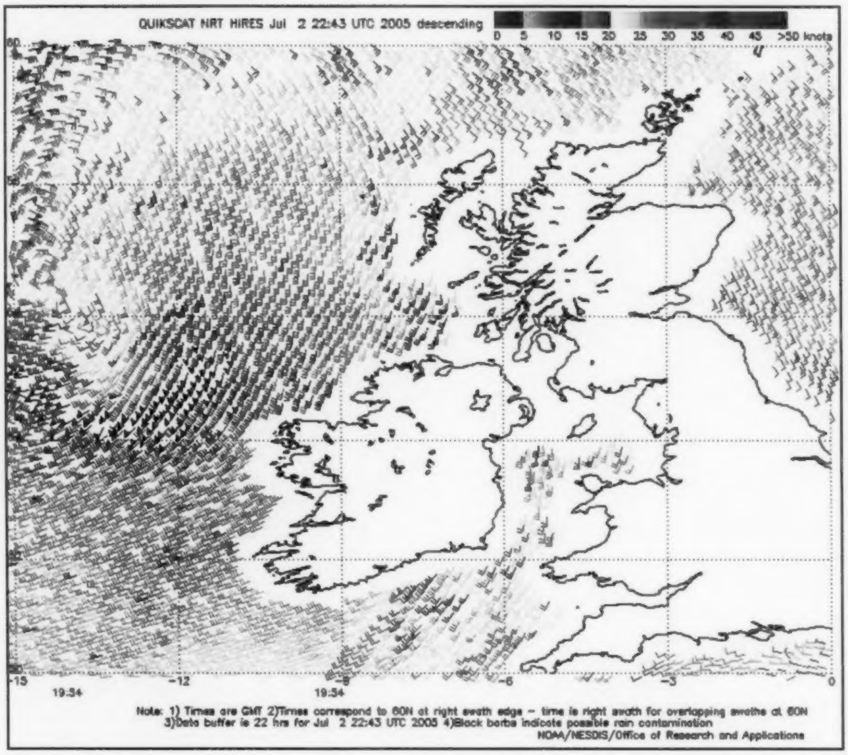


Figure 13.–High-resolution QuikScat scatterometer image of satellite-sensed winds valid at 1954 UTC July 2, 2005. The valid time of the pass is about four hours prior to the valid time of the second part of *Figure 12*. *Image is courtesy of NOAA/NESDIS/Office of Research and Applications.*

and even a couple of 65 kts barbs which appear to be rain-contaminated. There are even 50 kts barbs in the easterly flow north of the center. The **Pelagia** (PGRQ) reported northwest winds of 52 kts and 5.0 m seas (17 ft) near 55N 16W at 1800 UTC July 2. Buoy 62566 (58N 17W) reported northwest winds of 45 kts at 0100 UTC on the 3rd, while 62105 (55.5N 12.5W) had seas of 7.5 m (25 ft). The cyclone subsequently drifted northwest and weakened, and dissipated over Iceland on July 5.

North Atlantic Storm of August 5–7: Referring back to ***Figure 1***, a Newfoundland low moved northeast and developed into a storm over a 36-hour period ending at 0000 UTC August 6. The quikscat image in ***Figure 14*** is valid about eight hours later and reveals winds of up to 80 kts southeast of Cape Farewell, Greenland. The northeast winds appear to be enhanced by the proximity to the Greenland coast, and the higher winds may be an overestimate due to rain contamination. It is still possible there could be maximum winds of hurricane force near Cape Farewell. The winds of at least 50 kts extend well to the east in easterly flow. The **Atlantic Peace** (DEOT) encountered northeast winds of 50 kts near 56N 47W at 0600 UTC August 6. The system then continued on a northeastward track and weakened to a gale near 61N 35W at 0000 UTC on the 8th, before drifting east and dissipating near Iceland on the 10th.

Northeast Atlantic Storm of August 23–24: ***Figure 15*** depicts the rapid development of this storm from a frontal wave of low pressure shown in the first part of the figure. A true meteorological "bomb", this cyclone deepened by 36 hPa in the twenty-four hour period ending at 0000 UTC on the 24th. The central pressure bottomed out at 963 hPa at 0600 UTC on the 24th, making it the deepest low (in terms of central pressure) of the four-month period in the North Atlantic and North Pacific. This intensity is quite unusual for a summer cyclone

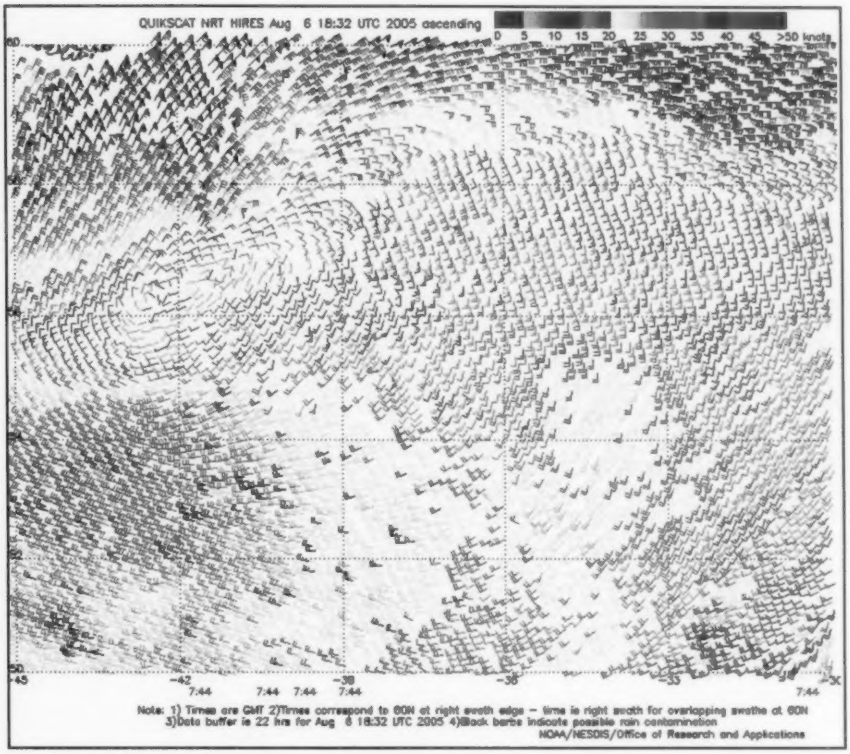


Figure 14.–High-resolution QuikScat scatterometer image of satellite-sensed winds valid at 0744 UTC August 6, 2005. The valid time of the pass is almost eight hours later than the valid time of the second analysis in *Figure 1*. *Image is courtesy of NOAA/NESDIS/Office of Research and Applications.*

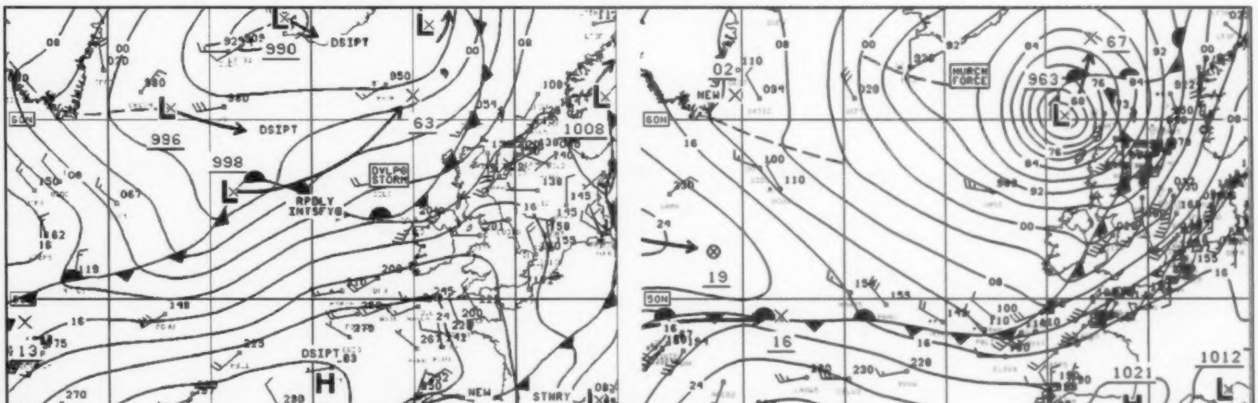


Figure 15.–OPC North Atlantic Surface Analysis charts (Part 1) valid 0600 UTC August 23 and 24, 2005.

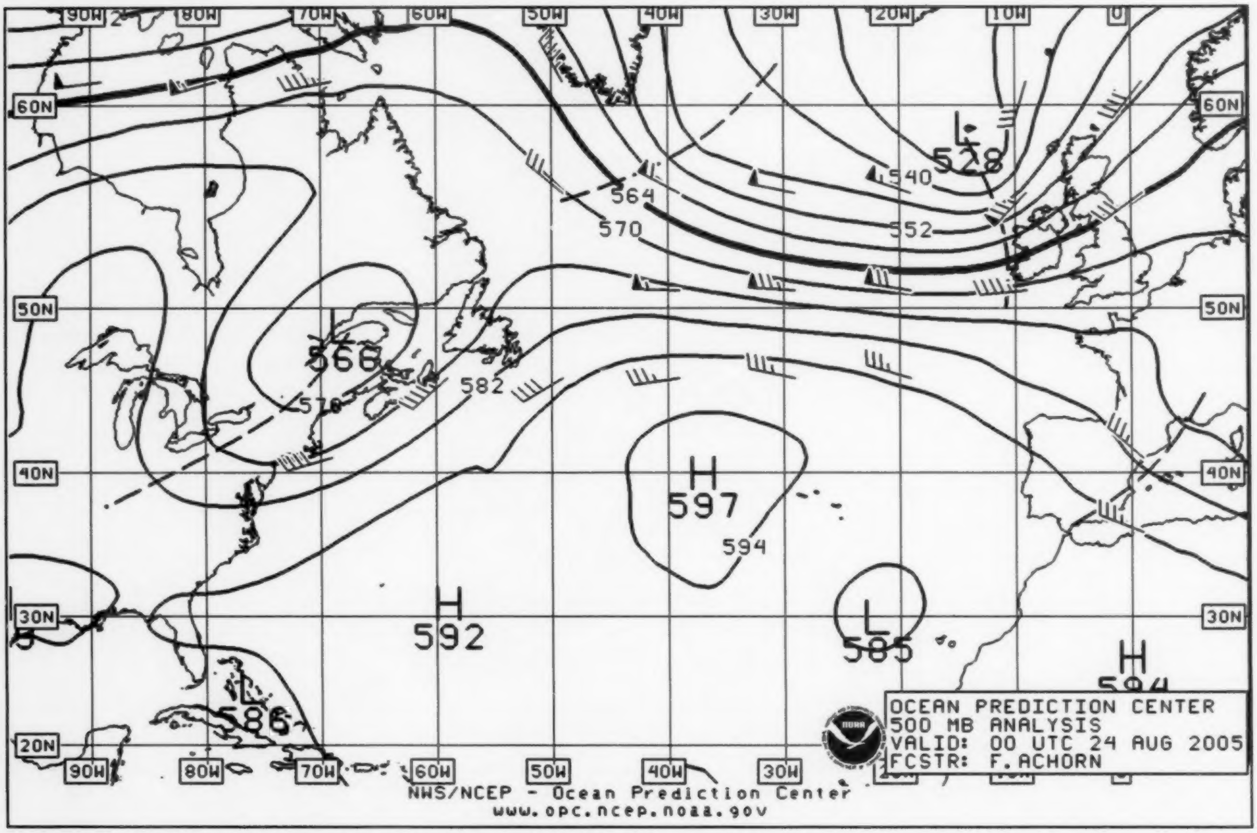


Figure 16.–OPC North Atlantic 500-mb Analysis valid 0000 UTC August 24, 2005. The dashed lines are short-wave troughs. The chart's valid time is six hours prior to that of the second part of *Figure 15*.

that did not have tropical origins, and is 1 hPa deeper than the intensity Tropical Storm Irene developed after becoming extratropical. The 500 hPa analysis in ***Figure 16*** shows good support for this development in the form of a 75 kts jet and a short wave trough developing negative tilt. See ***Reference 2*** for more information on the use of the 500 hPa chart. The **Charles Darwin** (GDLS) encountered west winds of 45 kts near 55N 13W at 0000 UTC on the 24th. The buoy 62114 (58N 0W) reported south winds of 55 kts six hours later. The cyclone subsequently turned north and weakened, passing north of the area as a gale early on the 25th.

Northeast Atlantic Storm of August 28–29: This storm quickly followed its predecessor and originated from a frontal wave south of Newfoundland on the 25th. This cyclone tracked farther north and was not as deep as the previous storm, but OPC briefly classified it as hurricane force at 0600 UTC on the 29th, when the central pressure was 972 hPa. The **Naja Arctica** (OXVH2) encountered southwest winds of 55 kts near 59N 15W at 1800 UTC August 28. At 1200 UTC on the 29th the ship **British Cormorant** (MGRX2) reported west winds of 55 kts near 62N 1W. OPC analyzed maximum seas of 9 m (30 ft) in this area on its sea state analysis on August 29. This system subsequently moved quickly northeast of OPC's radiofacsimile map area by early on the 30th.

References

1. From Tropical Prediction Center website, http://www.nhc.noaa.gov/aboutsshs.shtml.

2. Sienkiewicz, J. and Chesneau, L., Mariner's Guide to the 500-Mb Chart, Mariners Weather Log, Winter 1995.

Marine Weather Review–North Pacific Area May through August 2005

By George P. Bancroft, NOAA National Center for Environmental Prediction

Introduction

This four-month interval is typically a period of declining non-tropical cyclonic activity as late spring progresses into summer. There was a hurricane-force storm just west of the U.S. Pacific Northwest offshore waters in late May, a very unseasonable event that stood out as the most significant non-tropical event of the period. July is typically the least active month over the North Pacific, and this year was no exception with much of the North Pacific having no storm-force lows, except for tropical activity. Cyclonic activity usually picks up in August, and this was somewhat the case in 2005, but unlike the North Atlantic, there were no deep lows with pressures below 980 hPa.

There was no tropical cyclone activity in the western North Pacific from May into the early part of June. Activity picked up thereafter, with June contributing one tropical cyclone, July three and August four tropical cyclones. Two of the cyclones entered OPC's high seas waters before becoming extratropical. No tropical cyclones redeveloped into powerful storms after becoming extratropical.

Tropical Activity

Typhoon Nesat: Nesat came from west of OPC's oceanic map area, reaching 23N 134E at 1800 UTC June 6 with maximum sustained winds 120 kts with gusts to 145 kts, and turned north toward Japan while weakening. By 1200 UTC June 8 Nesat was a minimal typhoon with maximum sustained winds 65 kts with gusts to 80 kts, near 26N 135E. The **Amapola** (H9YY) near 35N 135E reported south winds of 50 kts six hours later. The cyclone weakened to a tropical storm by 0000 UTC on the 9th, and became an extratropical gale thirty hours later while passing 200 nmi southeast of Tokyo. Nesat underwent some redevelopment as an extratropical low, briefly developing storm-force winds on the 12th. ***Figure 1*** depicts this transition to an extratropical storm over a sixty hour period. At 0000 UTC June 13 the **SeaLand Reliance** (WFLH) reported a south wind of 50 kts near 44N 176E. The cyclone then stalled in the western Bering Sea as a gale with the central pressure as low as 985 hPa early on

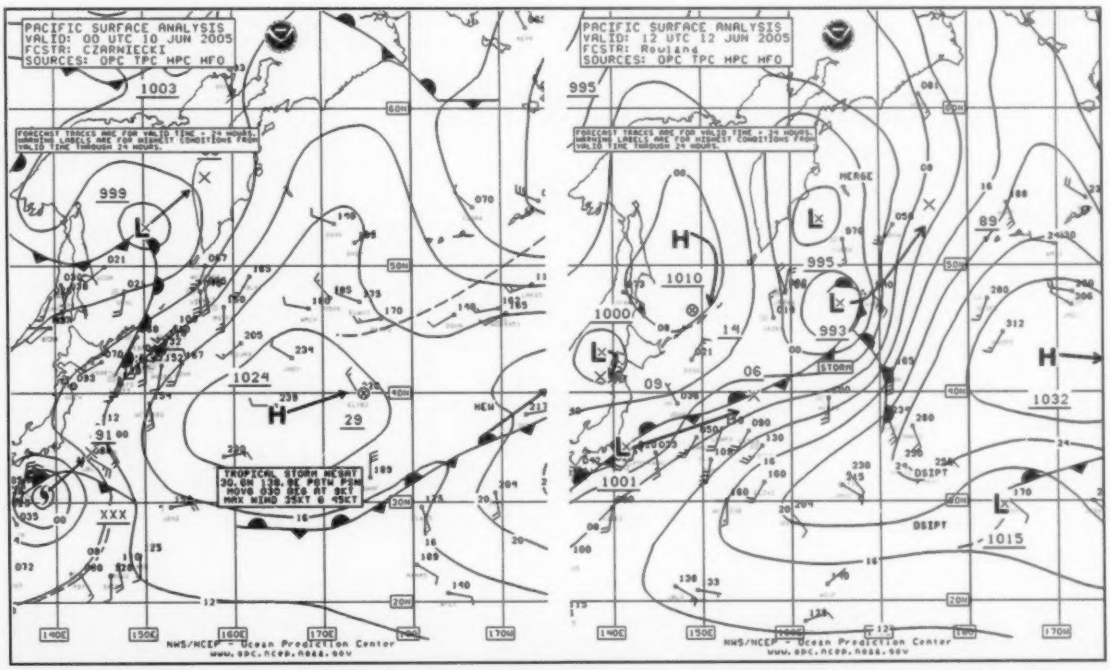


Figure 1.–OPC North Pacific Surface Analysis charts (Part 2) valid 0000 UTC June 10 and 1200 UTC June 12, 2005. Tropical Storm Nesat is depicted becoming an extratropical storm.

the 13th, before looping southeast and weakening to below gale force in the central Aleutians on the 16th.

Tropical Storm Haitang: Tropical Depression 05W formed near 23N 153E at 1200 UTC July 11 with maximum sustained winds 25 kts with gusts to 35 kts. The cyclone was named Tropical Storm Haitang at 0000 UTC July 12 near 23N 152E, with maximum sustained winds 35 kts with gusts to 45 kts. Haitang then intensified to a typhoon near 21N 146E at 1800 UTC on the 13th with maximum sustained winds 70 kts with gusts to 85 kts, and continued to track west while intensified. At 0600 UTC July 14 the **Taio Cosmos** (ELMA6) encountered north winds of 40 kts near 23N 139E while the typhoon was located near 20N 142E. Haitang then passed west of OPC's oceanic radiofacsimile map area early on the 15th and became a super typhoon while crossing 20N 130E at 0000 UTC on the 16th.

Tropical Storm Nalgae: Tropical Depression 06W formed near 24N 164E at 0000 UTC July 20 with maximum sustained winds of 30 kts with gusts to 40 kts and moved northwest, becoming Tropical Storm Nalgae six hours later. The cyclone developed a maximum intensity of 50 kts sustained winds and gusts to 65 kts with the center near 29N 160E at 1200 UTC on the 21st. Nalgae crossed into OPC's high seas area (north of 30N and east of 160E) as a weakening tropical storm on July 22, with the center near 32N 160E at 1800 UTC July 22. Nalgae then became an extratropical gale near 34N 162E with 1006 hPa central pressure twenty-four hours later. The extratropical remains of Nalgae were later absorbed on July 28 by another low, former Tropical Storm Banyan, to be described below.

Tropical Storm Banyan: Banyan arrived in OPC's oceanic map area from the south as a minimal tropical storm, located near 16N 138E at 0600 UTC July 22. Banyan intensified to a strong tropical storm while moving north to 25N 137E by 1200 UTC July 24, with maximum sustained winds 60 kts with gusts to 75 kts. The cyclone then weakened to a minimal tropical storm while passing just east of Tokyo early on the 26th, with extratropical transition coming early the next day. Some selected observations taken during the storm's passage are listed in ***Table 1***. ***Figure 2*** shows Tropical Storm Banyan becoming extratropical while passing east of Japan, during the 36-hour period ending at 0600 UTC July 27. The central pressure was as low as 980 hPa as extratropical Banyan passed over the southern Kurile Islands on the 27th, before the cyclone weakened.

Super Typhoon Mawar: Tropical Depression 11W formed near 21N 143E at 1200 UTC August 19 with maximum sustained winds 30 kts with gusts to 40 kts, and drifted northwest, intensifying to Tropical Storm Mawar six hours later with maximum sustained winds 45 kts with gusts to 55 kts. Mawar then continued to drift northwest while rapidly intensifying, becoming a typhoon near 22N 141E with maximum sustained winds 80 kts and gusts to 100 kts at 0000 UTC on the 21st, and a super typhoon twenty four hours later near 23N 139E with maximum sustained winds 130 kts and gusts to 160 kts. The cyclone then weakened in the next twenty-four hours and then maintained an intensity near 105 kts for sustained winds until early on the 24th. Mawar then passed south of Japan near 32N 137E on the 24th with maximum sustained winds 90 kts with gusts to 110 kts before turning more north and northeast. Mawar then passed just south of Tokyo at 1800 UTC August 25 with maximum sustained winds 85 kts and gusts to 105 kts. The ship (9MRW7) (32N 138E) encountered southwest

OBSERVATION	POSITION	DATE/TIME(UTC)	WIND(kt)	SEAS(m/ft)
Edisongracht (PDUJ)	22N 140E	23/0600	S 45	12.0/39
	21N 141E	24/0000	S 55	8.5/28
Maharashtra (VTSQ)	33N 139E	26/0000	SE 55	
Shinchi Maru (JBKB)	36N 144E	26/0000	SE 35	8.0/26
New Oasis (3ENO4)	33N 135E	26/0000	N 35	8.0/26
Overseas Joyce (WUQL)	35N 143E	26/1200	S 55	
Pudong Senator (DQVI)	38N 146E	27/0000	S 55	7.5/25
Buoy 52523	17N 139E	23/0800	SW 55	
Buoy 52520	23.5N 139.5E	24/0700	S 60	
Buoy 52690	28.2N 139.3E	25/0100	SE 50	

Table 1.–Some ship and buoy observations taken during passage of Tropical Storm Banyan.

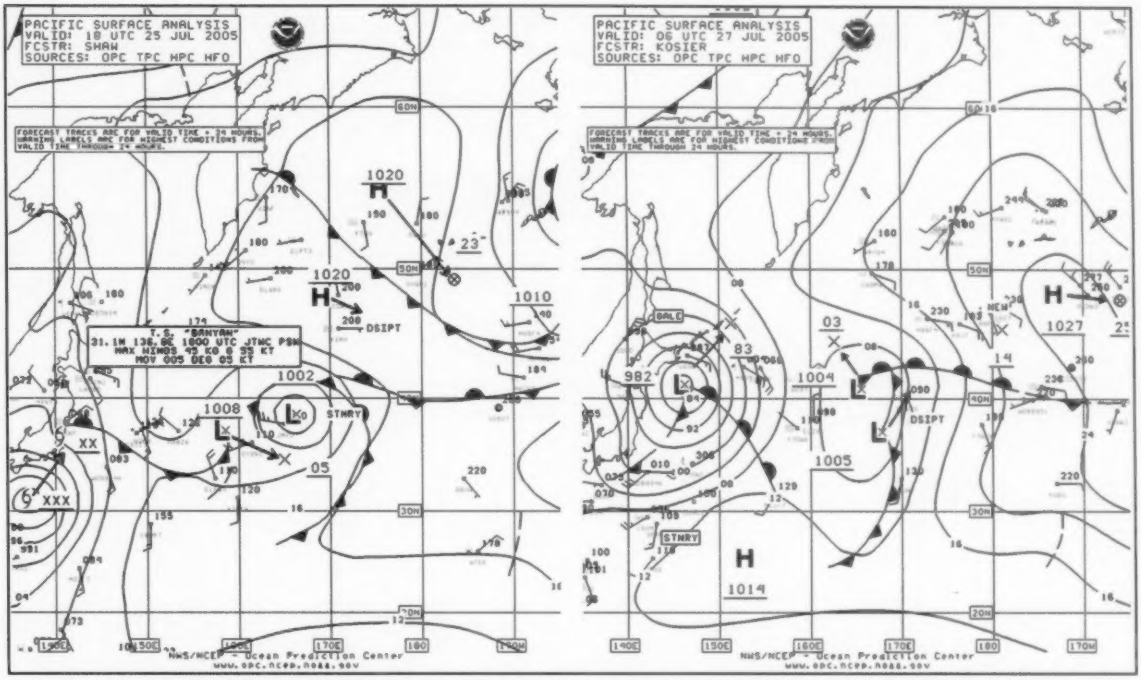


Figure 2.–OPC North Pacific Surface Analysis charts (Part 2) valid 1800 UTC July 25 and 0600 UTC July 27, 2005. Tropical Storm Banyan is shown becoming extratropical.

winds of 40 kts at that time. Mawar then weakened to a tropical storm by early on the 26th while heading northeast away from Japan, before becoming an extratropical gale near 37N 150E at 0600 UTC on the 27th. The extratropical remains of Mawar then drifted east, and dissipated by the end of the month.

Tropcal Storm Guchol: This cyclone was a weaker companion to Mawar, originating at about the same time as Tropical Depression 12W near 23N 151E at 0000 UTC August 20 and drifting northwest. The cyclone became Tropical Storm Guchol near 25N 148E at 0600 UTC August 21 with maximum sustained winds of 40 kts with gusts to 50 kts. At 0000 UTC on the 22nd Guchol reached maximum intensity, with maximum sustained winds 60 kts with gusts to 75 kts, near 27N 147E. The cyclone then maintained a similar intensity while moving northeast to 37N 153E by 0600 UTC on the 24th. ***Figure 3*** shows both Guchol and Mawar east and south of Japan, respectivley. Guchol then weakened and entered OPC's high seas area near 41N 160E as a minimal tropical storm at 0000 UTC August 25, and then became extratropical six hours later. Guchol's remains then moved north into the Bering Sea as a gale on the 27th, before reaching mainland Alaska on the 29th.

Figure 3.–OPC North Pacific Surface Analysis chart (Part 2) valid 0600 UTC August 24, 2005. Typhoon Mawar and Tropical Storm Guchol are shown.

Typhoon Talim: Tropical Storm Talim entered the far southwest portion of OPC's oceanic chart area, south of Japan and moved northwest, becoming a typhoon near 20N 137E at 1200 UTC August 28 with maximum sustained winds of 70 kts with gusts to 85 kts. The typhoon then passed west of 135W late on the 28th.

Typhoon Nabi: Nabi moved northwest to 17N 142E at the end of August with maximum sustained winds 105 kts with gusts to 130 kts as of 1800 UTC August 31.

Other Significant Events

North Pacific Storm, May 14–18: This low originated as a gale passing southeast of Japan on May 12 and moved across the North Pacific over the next five days, strengthening to a storm during the period from 1200 UTC May 14 until 1800 UTC May 15, with the central pressure down to 983 hPa by 0000 UTC on May 15 (***Figure 4***). Available ships reported gale-force winds, but a QuikScat overpass on the morning of May 15 revealed 50 kts wind barbs northeast of the center near the occlusion, and also south of the center. The cyclone was classified as a gale after it crossed the dateline, until it arrived off the U.S. West Coast where it attained its lowest central pressure of 977 hPa at 0600 UTC on the 18th. As the front approached the coast, the **Colorado Voyager** (KLHZ) (43N 126W) near the Oregon coast encountered south winds of 50 kts at 0000 UTC May 18. Reported seas were 6.0 m. The cyclone subsequently stalled and slowly weakened, and drifted north into the Gulf of Alaska by the 21st.

Northeast Pacific Storm of May 20–21: This cyclone was noteworthy for being unseasonably intense for this part of the North Pacific, and for producing hurricane-force winds at a time of year when they are quite rare when non-tropical systems are considered. ***Figure 5*** depicts the rapid development of this storm over a twenty-four hour period, with the lowest central pressure of 982 hPa coming six hours later than the time of the second part of ***Figure 5***. The infrared satellite image in ***Figure 6*** shows the storm near maximum intensity with cloud bands wrapping

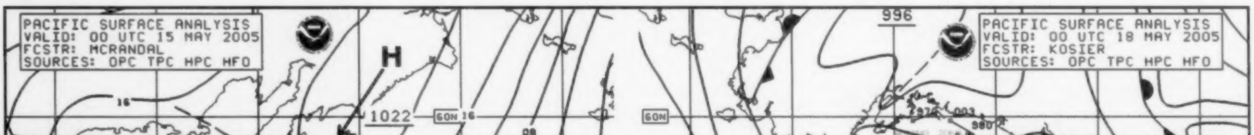


Figure 4.–OPC North Pacific Surface Analysis charts valid 0000 UTC May 15 (Part 2) and 0000 UTC May 18, 2005.

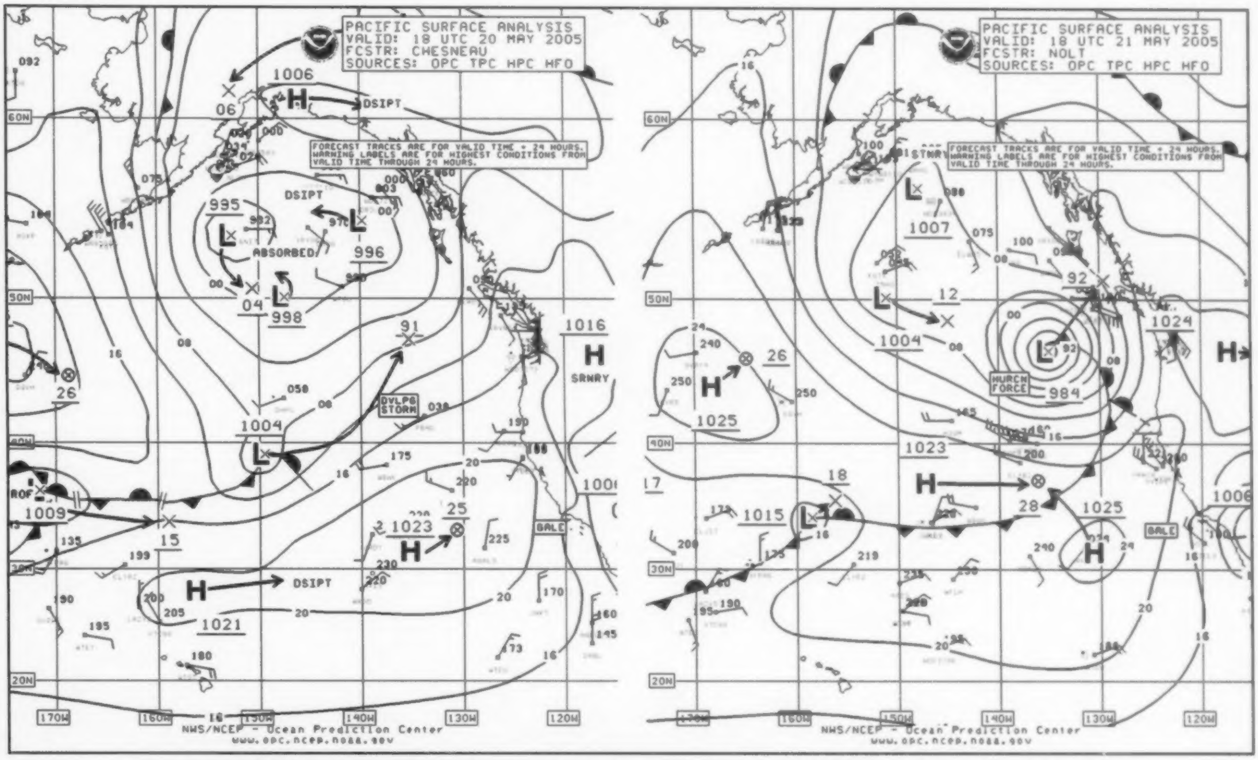


Figure 5.–OPC North Pacific Surface Analysis charts (Part 1) valid 1800 UTC May 20 and 21, 2005.

Figure 6.–GOES-10 infrared satellite image of the eastern North Pacific valid at 1800 UTC May 21, 2005. Satellite senses temperature on a scale from black (warm) to white (cold) in this type of image. The time of the image is the same as that of the second part of *Figure 5*.

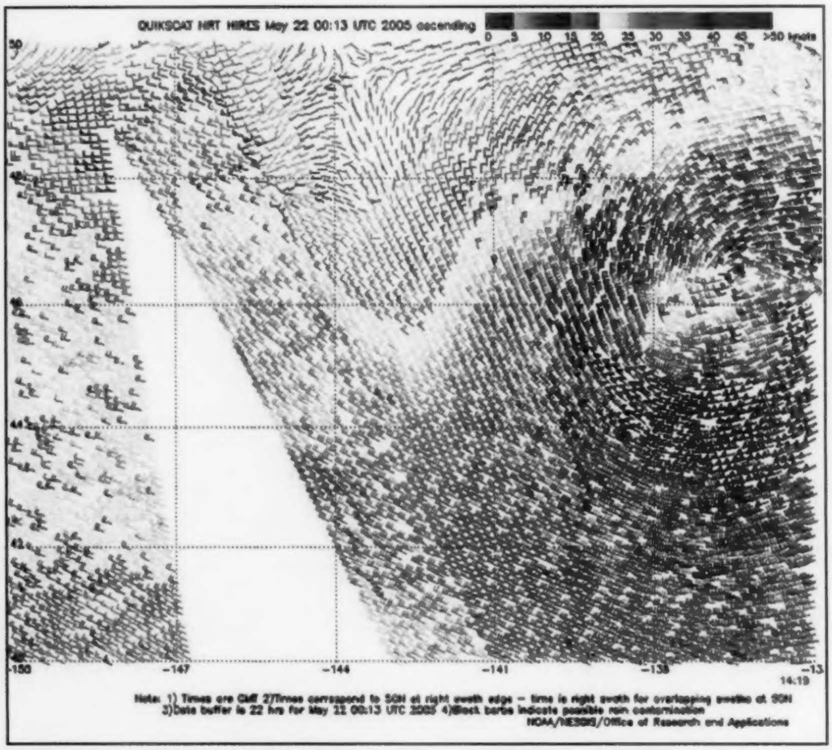


Figure 7.–High-resolution QuikScat scatterometer image of satellite-sensed winds valid at 1419 UTC May 21, 2005, or about three and one-half hours prior to the valid times of *Figure 6* and the second part of *Figure 5*. The resolution is 12.5 km, versus the 25 km resolution of regular QuikScat imagery.

Image is courtesy of NOAA/NESDIS /Office of Research and Applications.

around the well-defined center, and broad cold-topped frontal features north and east of the center. The QuikScat winds of up to 70 kts south of the center as shown in ***Figure 7*** support the hurricane-force label in the second part of ***Figure 5***. The **Akashi Bridge** (H3QM) (40N 140W) reported southwest winds of 55 kts at 0600 UTC May 21. The hurricane-force winds lasted only 6 to 12 hours, as the cyclone weakened after 0000 UTC May 22 and then dissipated inland early on the 23rd.

Eastern North Pacific Storm of June 14–16: This storm also affected the waters off the U.S. West Coast but was not as intense. ***Figure 8*** shows the development of this storm from a frontal wave of low pressure over a thirty-six hour period. ***Table 2*** lists some ship and buoy observations taken during the storm. Additionally the buoy 46002 (42.6N 130.4W) reported a lowest pressure of 991.7 hPa at 2000 UTC on the 16th. Available conventional observations show only gales, but the quikscat image in ***Figure 9*** reveals scattered 50 kts wind barbs southwest and west of the center which is marked by an area of lighter winds within the area of stronger winds. The cyclone developed a maximum intensity of 989 hPa at 0000 UTC June 17 as it drifted east. The system then drifted southeast and weakened, before dissipating on the 20th.

OBSERVATION	POSITION	DATE/TIME(UTC)	WIND(kt)	SEAS(m/ft)
Century Leader No. 3 (JADY)	46.7N 130W	16/0600	E 40	
Hatsu Elite (VSJG7)	38.3N 130.7W	17/0600	NW 45	
Buoy 46006	40.8N 137.5W	15/1800	SW 35 G43	5.0/16
		15/2300	Peak gust 49	7.0/23
Buoy 46002	42.6N 130.4W	15/2300	SE 33 G43	4.0/13
		16/2000	Maximum 6	5/16
Buoy 46015	42.7N 124.8W	17/1000	S 35 G43	5.5/18
		17/1100	Peak gust 45	6.0/20
Buoy 46050	44.6N 124.5W	17/0700	S 29 G35	6.0/20
		17/0600	Peak gust 39	

Table 2.–Ship and buoy observations taken in the storm of June 14–16.

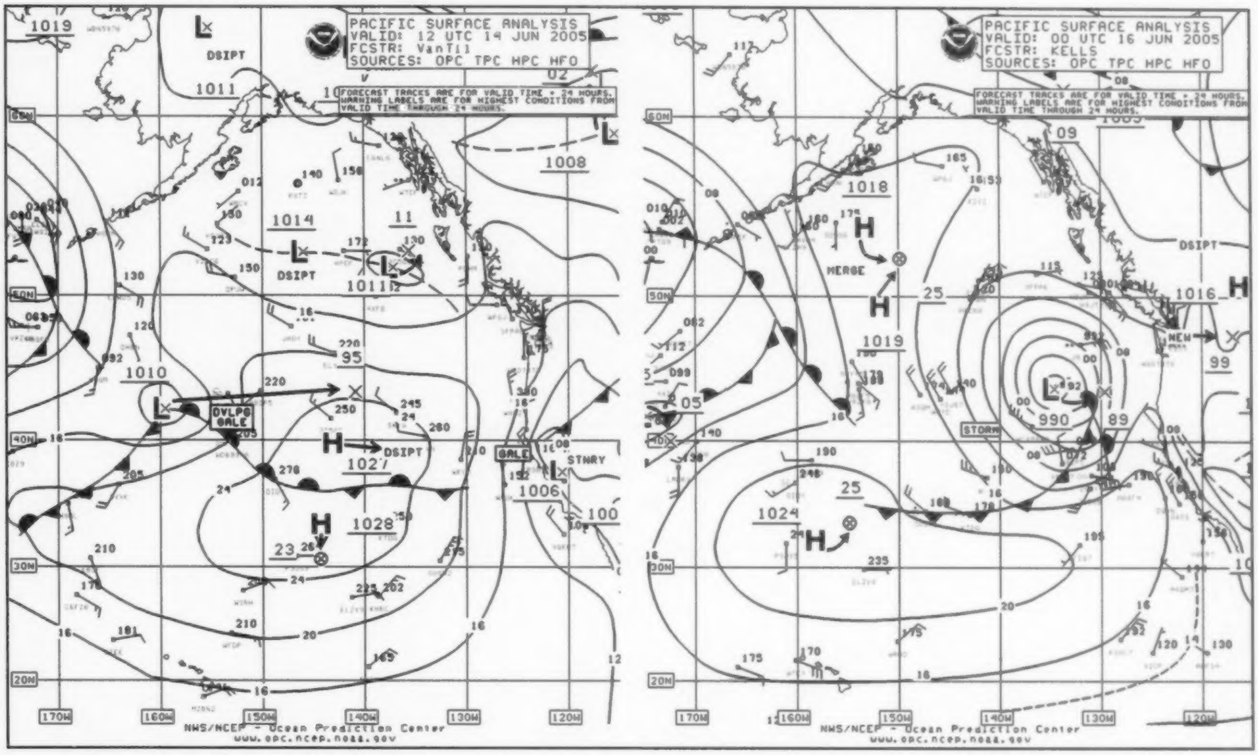


Figure 8.–OPC North Pacific Surface Analysis charts (Part 1) valid 1200 UTC June 14 and 0000 UTC June 16, 2005.

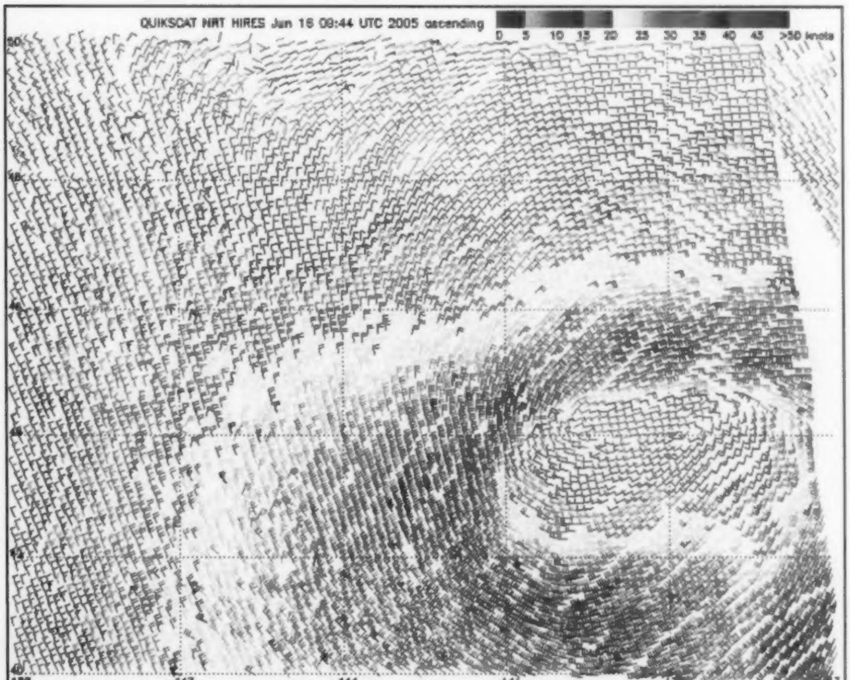


Figure 9.–High-resolution QuikScat scatterometer image of satellite-sensed winds around the storm shown in the second part of *Figure 8*. The valid time of the pass is 1512 UTC June 15, 2005, or about nine hours prior to the valid time of the second part of *Figure 8*.
Image is courtesy of NOAA/NESDIS/ Office of Research and Applications.

Western North Pacific Storm, June 28–30: ***Figure 10*** depicts the development of this storm over a forty-eight hour period with the cyclone reaching maximum intensity of 970 hPa at 0000 UTC June 28. This cyclone was the most intense (in terms of central pressure) non-tropical low of the four-month period in the North Pacific. There was one ship, the **Century Leader No. 3** (JADY), reporting storm-force winds, a 50 kts northwest wind near 43N 156E at 0600 UTC June 30. The same ship reported south winds of 45 kts, 6.0 m seas (19 ft) and a pressure of 972.0 hPa near 44N 160E twelve hours prior. ***Figure 11*** reveals a tight and well-defined circulation center in the QuikScat winds and several wind barbs in the 50 to 60 kts range southwest of the center. Some of the Kurile Islands appear in the upper left portion of the image. The storm then weakened to a gale early on June 30 while heading northeast, followed by an eastward turn near the western Aleutians. The low then continued to weaken and dissipated near Southeast Alaska on July 6.

Eastern North Pacific Storm of August 11–12: ***Figure 12*** shows the development of this relatively compact cyclone over a twenty-four hour period, with the second part of ***Figure 12*** depicting the storm with its lowest central pressure of 996 hPa. The **OOCL Los Angeles** (DBUQ) (43N 147W) encountered north winds of 50 kts at 1800 UTC August 11. This report was supported by a QuikScat pass from four hours earlier (***Figure 13***) which showed winds in the 40 to 55 kts range in the area where the ship reported, and even a 60 kts barb northwest of the center.). The storm subsequently turned northwest and weakened to a gale by early on the 12th. The cyclone then moved north and dissipated south of Kodiak Island late on August 14.

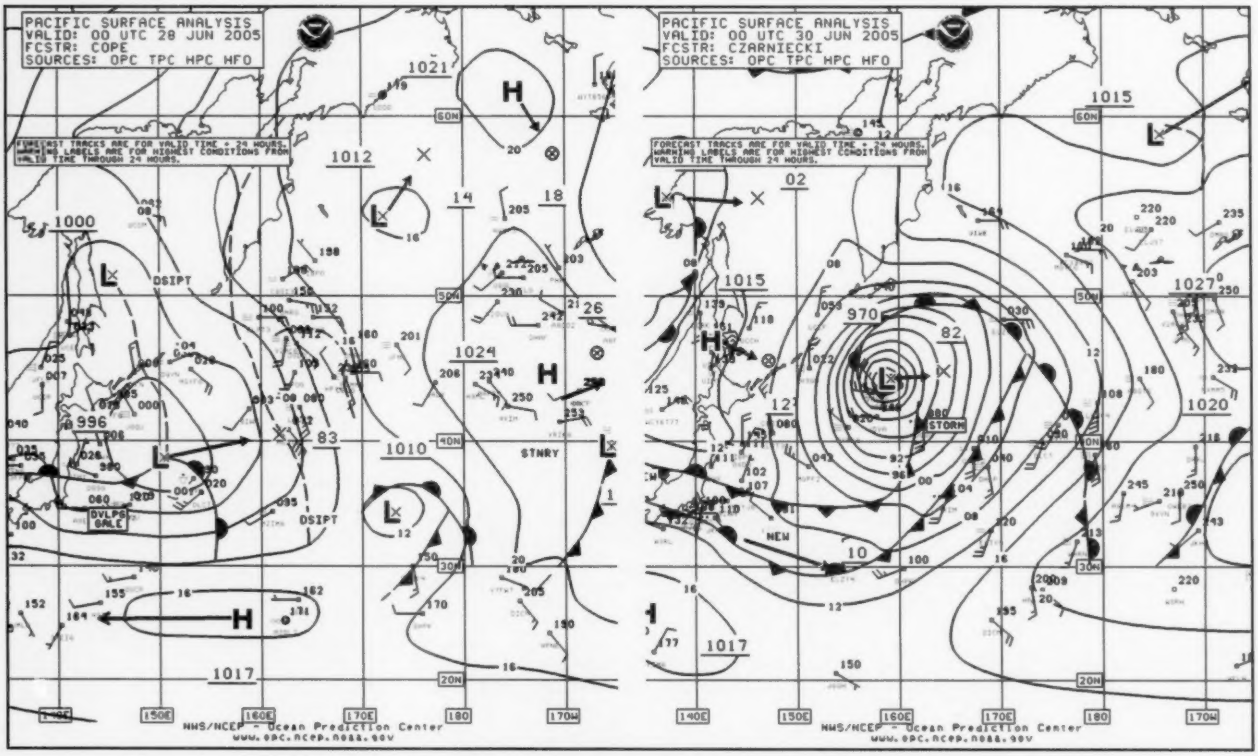


Figure 10.–OPC North Pacific Surface Analysis charts (Part 2) valid 0000 UTC June 28 and 30, 2005.

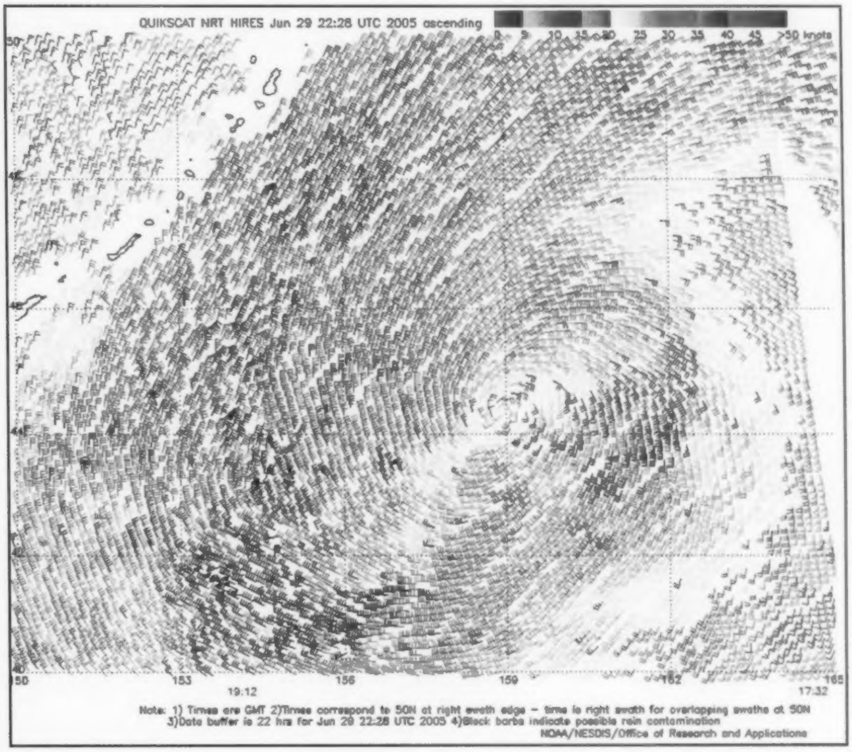


Figure 11.–High-resolution QuikScat scatterometer image of satellite-sensed winds around the storm shown in *Figure 10*. The valid time of the pass is approximately 1912 UTC June 29, 2005, or about five hours prior to the valid time of the second part of *Figure 10*.

Image is courtesy of NOAA/NESDIS/ Office of Research and Applications.

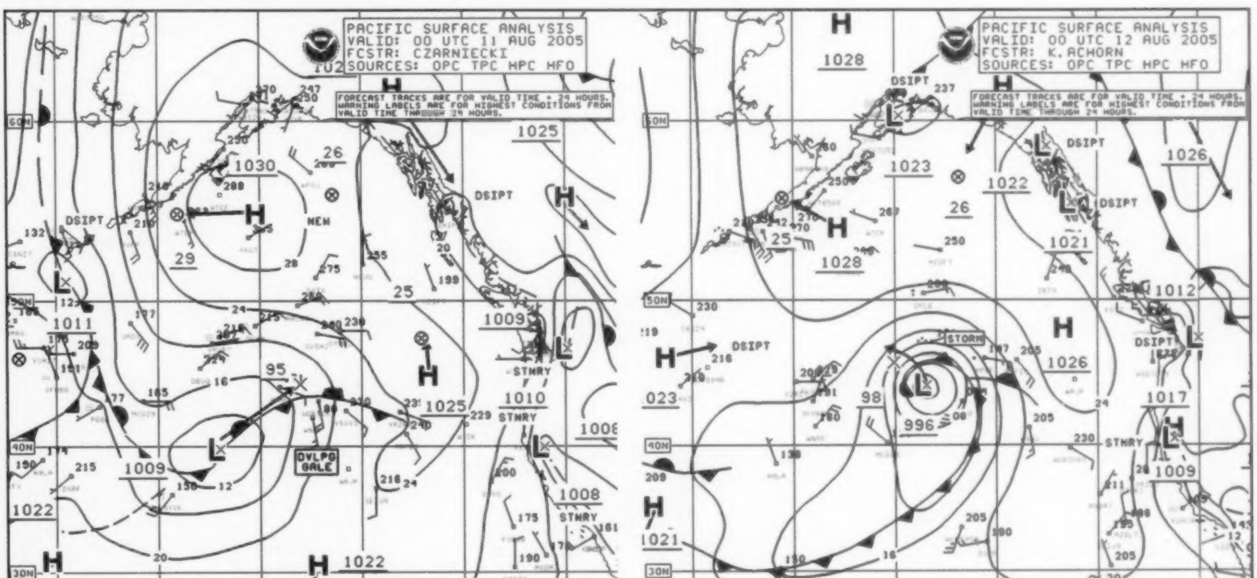


Figure 12.–OPC North Pacific Surface Analysis charts (Part 1) valid 0000 UTC August 11 and 12, 2005.

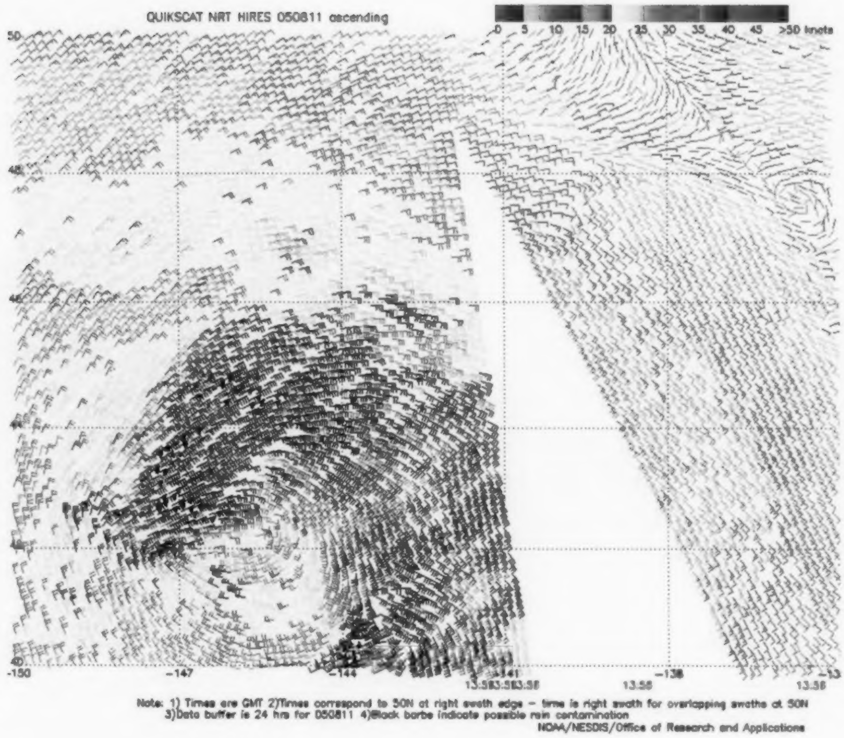


Figure 13.–High-resolution QuikScat scatterometer image of satellite-sensed winds around the storm shown in *Figure 12*. The valid time of the pass is 1358 UTC August 11, 2005, or about ten hours prior to the valid time of the second part of *Figure 12*.

Image is courtesy of NOAA/NESDIS/ Office of Research and Applications.

Western North Pacific Storm, August 15–16: This cyclone was another brief spinup of a compact storm similar to the one above in the eastern Pacific. A low moving off Japan on the 15th briefly became a storm with a 993 hPa central pressure near 43N 164E at 1200 UTC August 16, before stalling and then drifting southeast while weakening. A high-resolution scatterometer pass at about 0700 UTC on the 16th showed a compact circulation with several 50 kts wind barbs northeast of the center near 46N 164E. At 1800 UTC August 16 the ships **Roger Revelle** (KAOU) (47N 161E) and **Nova Terra** (C6IZ) (47N 167E) reported northeast winds of 35 kts and 4.0 m seas (13 ft) and east winds of 35 kts with 3.5 m seas (12 ft), respectively.

References

1. From Tropical Prediction Center website, http://www.nhc.noaa.gov/aboutsshs.shtml.

2. Sienkiewicz, J. and Chesneau, L., Mariner's Guide to the 500-Mb Chart, Mariners Weather Log, Winter 1995.

Mean Circulation Highlights and Climate Anomalies May through August 2005

A. James Wagner, Senior Forecaster, Climate Operations Branch, Climate Prediction Center /NCEP/NWS/NOAA.

May-June 2005

The circulation pattern over the Northern Hemisphere during May and June was characterized by generally above normal middle tropospheric heights and sea level pressure over much of the Arctic Basin and parts of northeastern Canada and the north Atlantic, as well as southwestern Europe and the western Mediterranean. The 500 hPa heights and sea level pressure were generally near or slightly below normal across middle latitudes of most of the Northern Hemisphere, but with no unusually strong anomalies. To some degree, these weak anomalies over the lower 48 States reflect two quite different circulation regimes that prevailed in May and June.

Although both months were unusually warm over Alaska under the influence of a persistent ridge, strong blocking over the Davis Strait and Labrador kept the westerlies well south of normal over the eastern U.S., resulting in widespread well below normal temperatures for the month. During June, the circulation changed dramatically, and a deeper than normal trough developed near the West Coast while an anomalously strong downstream ridge formed over the Northeast. Temperatures rapidly rose to well above normal over the region, with only a small area of the Southeast remaining cool. The strong trough over the West continued the rainy season well beyond its usual end in June, which provided some limited relief to the multi-year drought that had built up in the area due to several recent years with deficient cool-season precipitation. Coupled with below normal temperatures, this pattern had the additional benefit of providing at least a delay to the start of the summer wildfire season.

Elsewhere, a persistently strong ridge prevailed over the western Mediterranean and southwestern Europe during both months, and was related to early summer heat in that area, along with a continuation of a generally dry period that has been in place for most of the past year. Unusually cool weather prevailed over parts of northern and central Europe into early June, where as in the northeastern U.S., cool weather in May was replaced by warmer than normal weather later in June as ridging built over most of the region.

July-August 2005

During the high summer months of July and August, middle tropospheric heights and surface pressures remained higher than normal over the Arctic Basin, particularly on the Asian side. The abnormally strong ridge also remained in place near or over Alaska most of the time, leading to the second unusually warm and rather dry summer in as many years in many locations and contributing to another bad season for wildfires in the interior of the state. Relatively strong westerlies broke across the Gulf of Alaska to the south of this ridge, leading to a slightly enhanced 500 hPa trough off the Pacific Northwest coast, and a weaker than normal surface high over the eastern Pacific. Anomalies in the general circulation over the U.S. and Atlantic sectors were generally weak.

Both July and August were predominantly warmer than normal months over the lower 48 States, with the most excessive heat being located in the West in July and over most areas east of the Mississippi River during August. The heat was compounded by a very late arrival of the summer monsoon in Arizona and New Mexico, with many locations having record heat during the first two weeks of the month before the monsoon's arrival. During late July and most of August, generous amounts of rain fell in southern parts of Arizona and New Mexico, but the precipitation failed to penetrate very far to the north, except over parts of the southern Great Plains, where moisture was steered northward to the east of occasional troughs making their way through the Rockies and High Plains. Drought intensified over parts of the Midwest, particularly Illinois, and a new area of moderate drought developed in the middle Atlantic area which was missed by both the frontal activity at higher latitudes and tropical moisture to the south.

The Tropics

The status of the El Nino – Southern Oscillation (ENSO) phenomenon remained in neutral territory throughout the late spring and summer months. Moderately strong Madden-Julian waves progressed from the Indian Ocean region across the Pacific, but they were not strong enough to trigger Kelvin Wave activity in the subsurface Pacific. Throughout most of the summer, convective activity in the atmosphere was concentrated along a pronounced

ITCZ near 10 N over the Pacific.

Unusually warm sea-surface temperature over the entire tropical and subtropical Atlantic Basin was probably the main factor contributing to an extremely active tropical storm season in the area. Additional favorable items were generally low vertical wind shear and an active West African summer monsoon, which meant that the disturbances that become Atlantic tropical storms were already well-supplied with moisture when they moved out over the water.

The Atlantic hurricane season got off to an early start with two named tropical storms in June, only the twelfth time this many were observed in June since reliable records began in 1851. The month of July saw an unprecedented number of named storms (five), two of which became major hurricanes. This is the first time since 1916 that two major hurricanes formed in the Atlantic sector during July, and one of these (Dennis) attained Category 4 intensity over the Gulf of Mexico before weakening to a Category 3 storm when it made landfall in the western Florida Panhandle. By the end of August, five more named storms developed, and two of them became hurricanes, bringing the seasonal total to twelve named storms, three of them major (Category Three or higher). Of all the storms, Katrina was by far the worst, having the fourth lowest sea level pressure on record in the Atlantic Basin when it was a violent Category 5 storm over the Gulf of Mexico. Even though it weakened before making landfall in Louisiana and Mississippi, preliminary estimates are that it did more damage than any other natural disaster in the history of the United States. Although the casualty figures are not complete, the number is greater than for any hurricane in the U.S. for many decades. The total number of named storms in the Atlantic Basin through the end of August was almost as great as the number of typhoons in the western Pacific (fourteen), which is usually much larger.

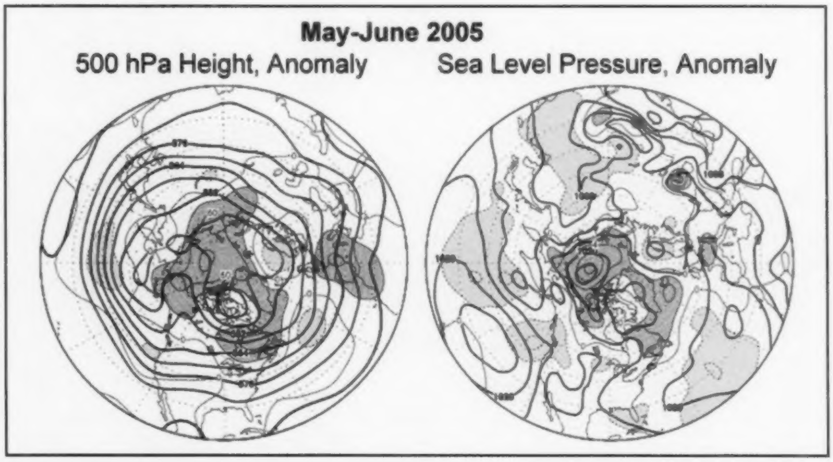
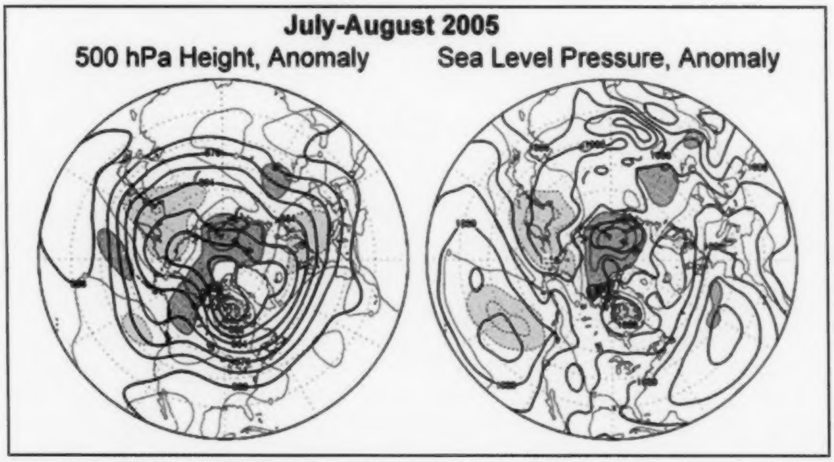


Figure legends and description of units:
The charts on the left shows the seasonal mean 500 hPa height contours at 60 m intervals in heavy solid lines, with alternate contours labeled in decameters (dm). Positive height anomalies are contoured in light solid lines at 30 m intervals, and light dashed lines show negative height anomalies. Areas of mean height anomalies more than 30 m above normal have heavy shading, and areas of mean height anomalies more than 30 m below normal have light shading.
The charts on the right show the seasonal mean sea level pressure (SLP) at 4 hPa intervals in heavy solid lines, labeled in hPa at selected intervals. Anomalies of SLP are contoured in light lines at 2 hPa intervals, with dark shading and solid lines in areas more than 2 hPa above normal, and light shading with dashed lines in areas greater than 2 hPa below normal.



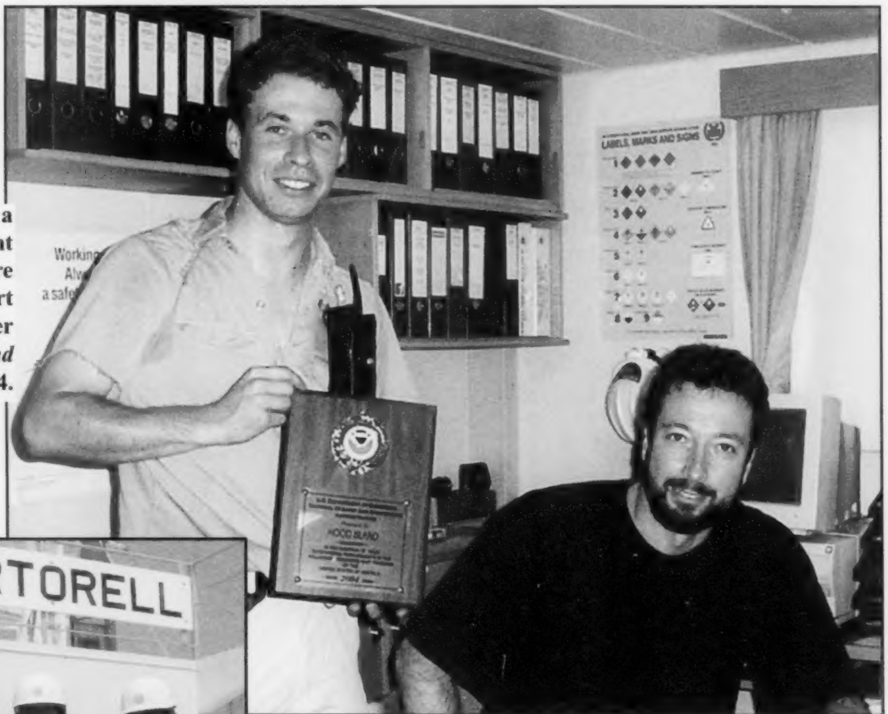
There were a total of nine named storms over the eastern Pacific. The most unusual event was the first storm of the season, Adrian, which moved northeastward into El Salvador and Honduras on May 20 as a tropical depression after weakening from hurricane intensity before landfall.

VOS Program Awards

The *Discoverer Deep Seas* received a 2004 VOS Award. Receiving the award are (left to right) Captain Doug Banfield, DPO William Wiggins, Chief Mate Jim Thelen, Third Mate/DPO Mike Jones, Third Mate/Sr. DPO Scott Beck.

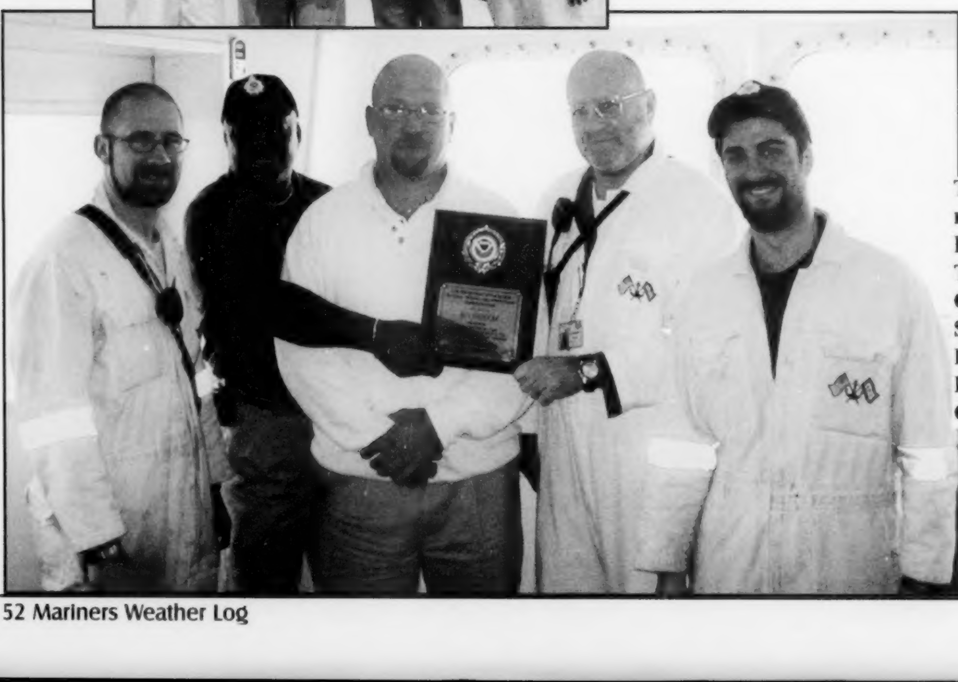
The officers of the *Edyth L* received a VOS Award. Pictured left to right are Captain J. Walker, Third Officer J. Ocio, Chief Officer A. Gagaring, and Second Officer A. Rocha.

Recieving the VOS Award for the *GSF Explorer* are left to right: DPO/Second Mate Richard Erwin, Second Mate Douglas Jaarsma, and Chief Mate Jason Charpentier.

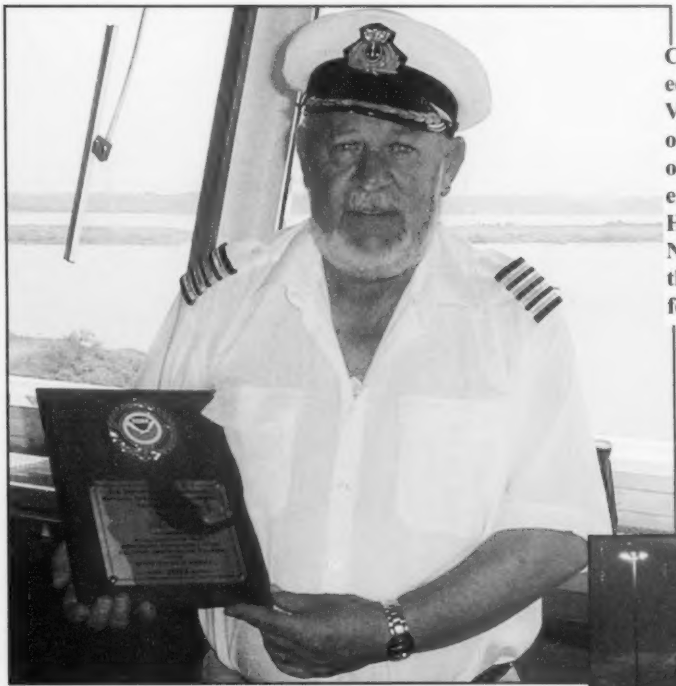


The *Hood Island* received a 2004 VOS Award. Left to right receiving the award are Second Officer Bart D'Haeseleer and Chief Officer Savo Loncar. The *Hood Island* sent 443 observations in 2004.

Accepting the 2004 VOS Award for M/V *Martorell* of MK Ship Management are (left to right) Captain Minehiro Morimoto, Captain Adolfo B. Gianan, Chief Mate Rosalino S. Salinas, and Second Mate Kennedy Q. Pastoriza. *Martorell* recorded and transmitted more than 450 observations during their eight months in the program. The US VOS program congratulates them on a job well done.



The M/V *Freedom* received a VOS Award. Pictured left to right are Third Officer Paul Cunningham, PMO Jim Saunders, Captain Dave Ledoux, Second Officer Dennis Flynn, and Chief Officer Shawn Hagerty.



Captain M. Thorp of the vessel *Saudi Tabuk* was presented the annual VOS Award for 2004. This is their first VOS Award for outstanding performance in marine observations. The crew provided over 647 quality marine observations during 2004. A number of which were extremely important during the erratic movement of Hurricane Gaston along the U.S. East Coast. The National Weather Service and NOAA extends a special thanks to both the Master and Mates of the *Saudi Tabuk* for their continued support.

Receiving the VOS Award for the NOAA ship *Ronald Brown* are left to right: LTJG jeffrey Shoup, CAPT Timothy Wright, LCDR Les Cruise, LT Elizabeth Jones, CDR Wade Black, LTJG Silas Ayers (kneeling).

The MV *Liberty* received a VOS Award. PMO James Saunders (right) presented the award to Captain John Hefner (left).

National Weather Service VOS Program New Recruits From July 1, 2005 through October 31, 2005

Name of Ship	Call	Agent Name	Recruiting PMO
ALASKAN NAVIGATOR	WDC6644	ALASKAN NAVIGATOR C/O ALASKA TANKER COMPANY	VALDEZ, AK
AMERICAN REPUBLIC	WYR5386	AMERICAN STEAMSHIP CO	CHICAGO, IL
APL NEW YORK	A8GS3	TF MARINE, INC	NEW YORK CITY, NY
BJ DISCOVERY	WCY2843	EDISON CHOUEST OFFSHORE	NEW ORLEANS, LA
CERAM SEA	9VHB9	NORD-SUD SHIPPING, INC	NEW ORLEANS, LA
CMA CGM TAGE	HPHQ	NORTON LILLY INTRL.	NORFOLK, VA
COURAGE	WDC6907	INTEROCEAN AMERICAN SHIPPING	BALTIMORE, MD
CP EXPLORER	ZCDP2	KERR NORTON STRATON	HOUSTON, TX
CP YOSEMITE	WDC6736	KERR NORTON STRACHAN	HOUSTON, TX
CRAIG FOSS	WX8610	CRAIG FOSS C/O FOSS MARITIME	KODIAK, AK
CSCL MELBOURNE	VRBI8	RENAISSANCE SHIPPING AGENCY	NORFOLK, VA
EMPRESS OF THE SEAS	C6SE6	RCCL	MIAMI, FL
FRED R WHITE JR	WAR7234	OGLEBAY NORTON MARINE SERVICES CO	CHICAGO, IL
HARVEY GAMAGE	WCY2572	OCEAN CLASSROOM FOUNDATION	NEW YORK CITY, NY
HIGH SEAS	ELJD7	HIGH SEAS C/O NWS	ANCHORAGE, AK
INTEGRITY	WDC6925	INTEROCEAN AMERICAN SHIPPING	BALTIMORE, MD
ISLAND SCOUT	WDC6588	ISLAND SCOUT C/O ISLAND TUG AND BARGE CO	ANCHORAGE, AK
LIBRA SALVADOR	V2AD6	TFMARINE	NEW YORK CITY, NY
LT GOING	IBTA		SEATTLE, WA
LT UNICA	IBSM		SEATTLE, WA
LT UNICORN	3FZC9	INTERNATIONAL SHIPPING CO.	SEATTLE, WA
MSC ULSAN	C6SV2	MSC (USA) INC.	NEW YORK CITY, NY
NORDSEAS	P3JR8	REEDERI NORD KLAUS E. OLDENDORFF LTD	NEW YORK CITY, NY
NUNANIQ	WRC2049	NUNANIQ C/O KELLY RYAN INC	ANCHORAGE, AK
OCEAN AMERICA	WSWM	DIAMOND OFFSHORE	HOUSTON, TX
OCEAN TITAN	WDC7175	PACIFIC-GULF MARINE	JACKSONVILLE, FL
OOCL TIANJIN	VRAR7	OOCL TIANJIN	ANCHORAGE, AK
ORANGE WAVE	ELPX7		NEW YORK CITY, NY
PYXIS LEADER	H9ML	BARBER SHIP MGMT EMPIRE TOWER 58TH FLOOR	JACKSONVILLE, FL
R/V ENDEAVOR	WCE5063	UNIVERSITY OF RHODE ISLAND, MARINE OFFICE	NEW YORK CITY, NY
SAKURA	V2AK3	TF MARINE	NEW YORK CITY, NY
SEA-LAND DEVELOPER	KHRH	PMO HOUSTON	HOUSTON, TX
SPIRIT OF MASSACHUSETTS	WCZ9474	OCEAN CLASSROOM FOUNDATION	NEW YORK CITY, NY
STAR JUVENTAS	LAZU5	GREIG BILLABONG AS	BALTIMORE, MD
TOURCOING	9V6488	WALLENIUS WILHELMSEN LINES AMERICA, LLC	NORFOLK, VA
VALDEZ RESEARCH	WXJ63	VALDEZ RESEARCH C/O NWS	VALDEZ, AK
WESTWARD	WDB4655	OCEAN CLASSROOM FOUNDATION	NEW YORK CITY, NY

37 More Recruits
Welcome Aboard!—Luke

VOS Cooperative Ship Report: January through October 2005

Ship Name	Call	Port	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
1ST LT HARRY L. MARTIN	NDFH	Jacksonville	1	0	0	0	0	0	0	0	0	0	0	0	1
2ND LT JOHN P. BOBO	WJKH	Norfolk	39	59	36	0	0	0	0	0	0	0	0	0	134
ADMIRALTY WIND	WCY7687	Anchorage	0	4	5	0	0	0	0	0	0	0	0	0	9
ADVANTAGE	WPPO	Norfolk	87	42	34	14	23	6	6	27	6	0	0	0	245
AKINADA BRIDGE	H9PN	Anchorage	0	35	0	9	48	0	0	0	0	0	0	0	92
ALASKAN EXPLORER	WDB9918	Valdez	0	0	0	9	8	11	2	0	26	31	0	0	87
ALASKAN FRONTIER	WDB7815	Valdez	0	0	0	0	0	4	48	36	0	6	0	0	94
ALASKAN LEADER	WDB7918	Kodiak	86	4	61	0	0	0	6	49	59	62	0	0	327
ALBATROSS IV	WMVF	Norfolk	45	100	98	113	119	47	117	141	142	136	0	0	1058
ALBEMARLE ISLAND	C6LU3	Miami	9	21	19	30	35	43	24	39	32	35	0	0	287
ALERT	WCZ7335	Valdez	7	1	2	6	3	2	1	13	7	29	0	0	71
ALKIN KALKAVAN	V7GY3	Norfolk	0	0	0	0	0	23	41	47	51	49	0	0	211
ALLIANCE NEW YORK	KDUE	New York City	0	0	0	0	0	14	0	0	0	0	0	0	14
ALTAIR VOYAGER	C6OK	Baltimore	10	11	49	58	38	47	38	85	69	31	0	0	436
AMERICAN NO. 1	WTY8664	Kodiak	0	0	1	0	0	0	0	0	0	0	0	0	1
AMSTERDAM	PBAD	Anchorage	20	28	24	34	25	4	6	0	1	1	0	0	143
ANTARES VOYAGER	C6PZ3	Oakland	9	19	24	42	8	6	1	0	32	35	0	0	176
APL ALEXANDRITE	9VBA	Oakland	0	0	0	0	0	0	0	0	0	58	0	0	58
APL ALMANDINE	9VBS	Norfolk	0	0	13	3	0	0	0	0	15	19	0	0	50
APL AMAZONITE	9VBX	Long Beach	14	51	29	60	46	46	24	30	49	21	0	0	370
APL CANADA	A8CG6	Oakland	0	0	0	25	50	31	41	40	34	41	0	0	262
APL CHINA	WDB3161	Long Beach	60	59	52	60	55	36	51	65	64	63	0	0	565
APL DALIAN	S6HU6	Norfolk	4	40	41	32	25	5	0	0	1	0	0	0	148
APL JADE	9VVD	New York City	0	0	0	0	0	16	8	10	8	0	0	0	42
APL JAPAN	S6TS	Seattle	51	74	27	33	65	82	62	71	68	76	0	0	609
APL KENNEDY	9VAY4	Seattle	66	51	57	62	37	35	46	61	45	46	0	0	506
APL KOREA	WCX8883	Long Beach	24	14	0	2	23	21	4	19	22	10	0	0	139
APL NEW YORK	A8GS3	New York City	0	0	0	0	0	0	0	0	35	51	0	0	86
APL PHILIPPINES	WCX8884	Long Beach	8	31	47	33	19	13	28	15	29	10	0	0	233
APL SCOTLAND	9VDD3	Seattle	0	0	22	0	0	0	0	0	0	0	0	0	22
APL SINGAPORE	WCX8812	Long Beach	40	37	0	36	47	44	47	46	26	52	0	0	375
APL SWEDEN	9VYY5	Seattle	26	33	65	52	60	29	56	18	21	22	0	0	382
APL THAILAND	WCX8882	Long Beach	58	25	2	38	38	39	30	27	36	19	0	0	312
APL TURQUOISE	9VVY	Oakland	19	23	13	4	17	20	30	42	27	11	0	0	206
ARAL SEA	S6CD2	Houston	0	50	48	68	63	53	31	9	13	1	0	0	336
ARCTIC BEAR	WBP3396	Kodiak	0	0	0	1	0	0	0	0	0	0	0	0	1
ARCTIC SUN	ELQB8	Anchorage	225	248	188	180	93	154	198	204	210	433	0	0	2133
ARCTIC WANDERER	WCZ8910	Kodiak	0	0	0	0	0	6	1	3	0	0	0	0	10
ARIZONA VOYAGER	KGBE	Miami	8	30	23	0	0	4	3	0	0	0	0	0	68
ARTHUR M. ANDERSON	WE4805	Chicago	0	0	2	42	50	24	47	0	12	29	0	0	206
ASPHALT COMMANDER	WFJN	New Orleans	33	5	27	0	0	1	0	58	53	28	0	0	205
ATLANTIC CARTIER	SCKB	Norfolk	0	0	0	0	0	0	43	41	37	30	0	0	151
ATLANTIC FOREST	WDB2122	New Orleans	4	0	36	23	2	9	16	0	15	12	0	0	117
ATLANTIC OCEAN	C6T2064	New York City	26	44	50	22	46	13	47	19	32	19	0	0	318
ATLANTIS	KAQP	Kodiak	0	0	6	8	8	9	0	0	0	3	0	0	34
ATTENTIVE	WCZ7337	Valdez	30	17	8	0	1	5	5	22	36	15	0	0	139
AURORA	WYM9567	Kodiak	0	0	0	0	1	0	0	0	0	0	0	0	1
AVIK	WDB7888	Anchorage	0	0	0	0	0	0	0	0	4	14	0	0	18
AWARE	WCZ7336	Valdez	13	21	14	2	6	4	3	7	15	17	0	0	102
BARBARA ANDRIE	WTC9407	Chicago	0	0	0	0	0	0	0	0	9	4	0	0	13

VOS Cooperative Ship Report

Ship Name	Call	Port	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
BARENTS SEA	9VAP5	New York City	22	35	51	35	7	0	0	0	0	0	0	0	150
BARRINGTON ISLAND	C6QK	Miami	46	45	65	37	24	55	61	85	73	85	0	0	576
BARROW RESEARCH	KCB53	Anchorage	0	0	0	26	31	22	27	23	29	26	0	0	184
BENGAL SEA	ELPL3	New York City	0	0	0	2	0	0	48	0	30	45	0	0	125
BERNARDO QUINTANA A	C6KJ5	New Orleans	55	20	38	25	30	41	58	51	60	43	0	0	421
BESIRE KALKAVAN	V7GY4	Norfolk	0	0	0	0	30	30	37	38	32	25	0	0	192
BILLIE H.	WCY4992	Kodiak	2	0	0	0	0	0	1	1	0	0	0	0	4
BJ DISCOVERY	WCY2843	New Orleans	0	0	0	0	0	0	0	0	0	39	0	0	39
BLUEFIN	WQZ9646	Kodiak	0	9	0	0	0	0	0	0	0	0	0	0	9
BOUCHARD BOYS	WCY7761	Kodiak	1	0	0	1	0	1	0	0	0	0	0	0	3
BOWFIN	WSX7318	Kodiak	0	2	6	0	0	0	0	0	0	0	0	0	8
BREEZE ARROW	LAOT4	Seattle	43	10	0	46	25	36	46	36	46	26	0	0	314
BRUCE	WWU8	Anchorage	23	26	29	27	26	16	23	5	17	16	0	0	208
BUCCANEER	WYW5588	Kodiak	0	0	4	0	0	4	1	1	0	0	0	0	10
BULWARK	WBN4113	Valdez	13	7	0	4	0	1	0	0	0	0	0	0	25
BURNS HARBOR	WDB4745	Chicago	2	0	4	15	25	4	0	0	0	0	0	0	50
CAJUN EXPRESS	ELXL3	Houston	8	73	15	43	58	47	20	24	16	17	0	0	321
CALA PROVIDENCIA	ELRR2	Miami	56	40	54	3	0	0	0	0	0	0	0	0	153
CAMAI	KF003	Kodiak	0	0	0	2	0	1	28	18	24	19	0	0	92
CANMAR PROMISE	ELXZ9	Anchorage	88	40	0	0	0	0	0	0	0	0	0	0	128
CAP DOUKATO	A8EW3	Charleston	11	0	10	0	0	0	0	0	0	0	0	0	21
CAPE VINCENT	KAES	Houston	0	0	27	31	0	0	0	0	0	0	0	0	58
CAPT STEVEN L BENNETT	KAXO	New Orleans	6	7	0	0	4	5	4	0	13	7	0	0	46
CARNIVAL CONQUEST	3FPQ9	New Orleans	3	9	13	2	0	17	36	21	0	0	0	0	101
CARNIVAL DESTINY	C6FN4	Miami	7	4	5	2	1	11	8	0	0	7	0	0	45
CARNIVAL GLORY	3FPS9	Jacksonville	7	0	12	33	40	34	42	39	23	10	0	0	240
CARNIVAL HOLIDAY	C6FM6	New Orleans	0	7	5	0	0	8	3	20	3	0	0	0	46
CARNIVAL LEGEND	H3VT	Miami	0	0	0	0	0	0	0	45	52	33	0	0	130
CARNIVAL MIRACLE	H3VS	Miami	0	0	0	0	0	0	5	0	0	0	0	0	5
CARNIVAL PRIDE	H3VU	Miami	4	0	1	2	5	1	0	0	0	0	0	0	13
CARNIVAL SENSATION	C6FM8	New Orleans	27	18	25	26	28	20	23	19	1	0	0	0	187
CARNIVAL SPIRIT	3FPR9	Anchorage	0	0	0	0	0	0	13	11	3	7	0	0	34
CARNIVAL TRIUMPH	C6FN5	Miami	18	8	8	13	4	11	6	13	2	8	0	0	91
CARNIVAL VALOR	H3VR	Miami	0	0	0	0	0	19	26	23	14	16	0	0	98
CARNIVAL VICTORY	3FFL8	Miami	16	11	39	36	30	34	22	17	11	13	0	0	229
CAROLINE MAERSK	OZWA2	Seattle	0	0	0	0	0	0	0	0	23	10	0	0	33
CARSTEN MAERSK	OZYB2	Seattle	6	27	0	0	0	0	0	0	0	0	0	0	33
CASON J. CALLAWAY	WE4879	Chicago	31	0	17	91	79	50	28	22	48	21	0	0	387
CELEBRATION	H3GQ	Jacksonville	15	0	14	0	13	5	0	0	0	0	0	0	47
CELINE	HBEF	New York City	0	1	0	0	0	0	0	0	0	0	0	0	1
CELTIC SEA	C6RT	Miami	0	0	0	23	20	16	36	20	24	23	0	0	162
CENTURY	C6FU5	Miami	9	10	12	6	3	0	0	0	0	0	0	0	40
CENTURY HIGHWAY #2	3EJB9	Long Beach	17	16	20	0	0	0	0	0	0	0	0	0	53
CERAM SEA	9VHB9	New Orleans	0	0	0	0	0	0	0	0	0	13	0	0	13
CHANG JIANG BRIDGE	3EZJ9	Seattle	37	54	74	57	17	40	59	61	67	41	0	0	507
CHARLES ISLAND	C6JT	Miami	50	65	59	63	54	17	32	39	51	39	0	0	469
CHARLES M. BEEGHLEY	WL3108	Chicago	12	0	4	12	6	13	2	9	7	21	0	0	86
CHARLESTON	WBVY	Houston	0	5	10	8	10	1	5	10	2	0	0	0	51
CHARLOTTE MAERSK	OWLD2	Seattle	0	0	0	0	0	0	0	0	23	24	0	0	47
CHEMICAL EXPLORER	KRGC	Houston	0	0	17	7	32	7	29	31	20	1	0	0	144
CHEMICAL TRADER	KRGJ	Houston	3	10	21	11	2	5	15	17	16	0	0	0	100
CHEROKEE BRIDGE	V7FW7	New York City	0	0	0	21	60	42	44	38	24	12	0	0	241
CHESAPEAKE BAY	WMLH	Norfolk	43	55	30	23	56	26	5	21	38	26	0	0	323
CHESAPEAKE BAY	V7FW8	New York City	0	0	0	0	16	24	41	38	43	31	0	0	193

Ship Name	Call	Port	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
BRIDGE															
CLEVELAND	KGXA	Houston	49	46	31	88	79	62	11	81	53	35	0	0	535
CLIFFORD MAERSK	OYRO2	Seattle	0	0	0	0	0	0	0	24	0	1	0	0	25
COASTAL MERCHANT	WCV8696	Seattle	0	0	0	1	3	0	0	0	0	0	0	0	4
COASTAL NAVIGATOR	WCY9686	Seattle	0	5	2	0	0	0	0	2	0	2	0	0	11
COASTAL NOMAD	WTP2735	Kodiak	0	1	0	1	8	3	0	0	0	0	0	0	13
COASTAL PILOT	WBP7281	Kodiak	1	3	0	0	0	0	0	0	0	0	0	0	4
COASTAL RELIANCE	WADZ	Kodiak	45	98	65	87	67	50	0	64	61	88	0	0	625
COLD BAY RESEARCH	KCI95	Anchorage	0	0	0	0	0	1	0	0	0	0	0	0	1
COLLIER BROTHERS	WUU7551	Kodiak	2	1	0	0	0	0	0	0	0	0	0	0	3
COLORADO VOYAGER	KLHZ	Oakland	1	2	0	0	7	6	2	0	0	0	0	0	18
COLUMBINE MAERSK	OUHC2	Seattle	0	53	0	22	16	0	21	0	29	35	0	0	176
COLUMBUS VICTORIA	P3RF8	Norfolk	21	17	19	8	17	22	19	11	17	15	0	0	166
CONDOR	PJWQ	New York City	0	0	0	37	48	51	56	42	71	2	0	0	307
CORAL SEA	C6YW	Miami	16	23	32	14	0	0	0	0	0	29	0	0	114
CORNELIA MAERSK	OWWS2	Seattle	10	0	51	0	15	32	0	36	4	6	0	0	154
CORNELIUS MAERSK	OYTN2	Seattle	0	0	0	0	0	0	0	5	0	0	0	0	5
CORWITH CRAMER	WTF3319	Kodiak	5	0	2	58	5	3	37	0	0	28	0	0	138
COURAGE	WDC6907	Baltimore	0	0	0	0	0	0	0	0	0	49	0	0	49
COURTNEY L	ZCAQ8	Baltimore	23	32	15	16	28	22	16	29	25	38	0	0	244
CP AMBASSADOR	ZCDJ4	Houston	0	0	5	0	1	0	0	0	0	0	0	0	6
CP DISCOVERER	WGXO	Houston	137	119	135	144	129	72	70	89	135	73	0	0	1103
CP DYNASTY	VSXC4	Anchorage	1	2	4	17	15	0	0	16	11	17	0	0	83
CP EAGLE	VSUA7	Anchorage	17	18	13	31	51	61	88	71	72	33	0	0	455
CP EVERGLADES	ZIYE7	Houston	22	19	26	11	17	12	24	16	27	7	0	0	181
CP EXPLORER	WGLA	Houston	64	102	43	79	77	67	37	37	41	0	0	0	547
CP EXPLORER	ZCDP2	Houston	0	0	0	0	0	0	0	0	0	20	0	0	20
CP JABIRU	A8CF4	Anchorage	41	65	63	53	79	51	53	81	86	94	0	0	666
CP LIBERATOR	WGXN	Houston	275	212	130	122	121	116	119	92	116	77	0	0	1380
CP NAVIGATOR	WGMJ	Houston	106	102	133	88	91	180	108	58	152	251	0	0	1269
CP TABASCO	VSUA5	Anchorage	31	42	24	6	1	0	17	3	0	5	0	0	129
CP VOYAGER	VSXC7	Anchorage	0	0	0	0	0	0	6	35	18	29	0	0	88
CP YOSEMITE	WDC6736	Houston	0	0	0	0	0	0	0	0	0	100	0	0	100
CRAIG FOSS	WX8610	Kodiak	0	0	0	0	0	0	0	4	8	0	0	0	12
CROSS POINT	WDA3423	Kodiak	0	0	0	0	0	0	0	4	4	0	0	0	8
CSCL MELBOURNE	VRBI8	Norfolk	0	0	0	0	0	0	0	0	0	16	0	0	16
CSCL NINGBO	VRBH5	Anchorage	32	18	4	0	0	0	0	0	0	0	0	0	54
CSL CABO	D5XH	Seattle	16	15	18	14	10	6	6	4	12	11	0	0	112
CYNTHIA FAGAN	KSDF	Houston	64	39	66	28	13	17	8	35	63	2	0	0	335
DAIO ANDES	3FDN9	Anchorage	9	76	76	80	89	41	63	92	77	0	0	0	603
DAVID FOSS	WYQ8110	Kodiak	0	0	0	0	14	52	38	44	8	0	0	0	156
DAVID STARR JORDAN	WTDK	Long Beach	53	131	3	144	92	87	50	131	191	122	0	0	1004
DEEPWATER HORIZON	V7HC9	Houston	160	135	150	108	156	178	172	122	101	207	0	0	1489
DEEPWATER MILLENNIUM	V7HD2	Houston	25	37	36	25	6	26	54	75	73	56	0	0	413
DELAWARE BAY	WMLG	Norfolk	30	20	42	38	19	14	39	31	22	11	0	0	266
DELAWARE BRIDGE	V2OE2	New York City	46	25	15	62	8	44	3	16	20	15	0	0	254
DELAWARE II	KNBD	New York City	5	79	113	97	39	107	120	137	74	38	0	0	809
DELAWARE TRADER	WDB3258	Houston	0	0	0	0	27	64	51	70	50	12	0	0	274
DENALI	WSVR	Long Beach	0	0	0	0	0	10	44	25	19	14	0	0	112
DIANE H.	WUR7250	Kodiak	0	0	0	7	4	3	38	64	62	82	0	0	260
DIRCH MAERSK	OXQP2	Long Beach	20	29	30	22	26	17	68	41	45	76	0	0	374
DIRECT TUI	ELVZ5	Norfolk	0	0	0	0	0	0	0	401	655	688	0	0	1744
DISCOVERER DEEP SEAS	V7HC6	New Orleans	0	5	42	29	38	38	68	60	39	44	0	0	363
DISCOVERER	V7HD3	New Orleans	1	0	3	3	21	5	23	26	21	7	0	0	110

VOS Cooperative Ship Report

Ship Name	Call	Port	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
ENTERPRISE															
DISCOVERER SPIRIT	V7HC8	Houston	22	16	35	32	18	11	27	23	19	19	0	0	222
DISNEY MAGIC	C6PT7	Jacksonville	0	0	0	0	0	0	0	4	9	1	0	0	14
DOUBLE EAGLE	WYE6617	Kodiak	0	0	0	0	0	0	0	0	3	13	0	0	16
DREW FOSS	WYL5718	Kodiak	0	24	0	7	1	0	0	0	1	0	0	0	33
DUNCAN ISLAND	C6JS	Miami	45	41	63	48	53	49	19	14	18	25	0	0	375
EARL W. OGLEBAY	WZE7718	Chicago	0	0	0	0	0	0	1	22	50	66	0	0	139
ECSTASY	H3GR	Miami	10	7	10	10	11	10	12	2	1	0	0	0	73
EDGAR B. SPEER	WQZ9670	Chicago	0	0	0	0	0	4	0	0	0	0	0	0	4
EDYTH L	ZCAM4	Baltimore	28	34	25	29	53	55	72	35	0	66	0	0	397
EL MORRO	KCGH	Jacksonville	20	25	12	30	24	25	31	26	57	53	0	0	303
EL YUNQUE	WGJT	Jacksonville	41	22	33	64	66	33	31	54	61	56	0	0	461
ELATION	3FOC5	Miami	29	31	44	28	40	41	31	35	20	2	0	0	301
EMMA FOSS	WCF3931	Kodiak	0	0	0	0	6	115	90	93	101	34	0	0	439
EMPIRE STATE	KKFW	New York City	0	0	0	0	12	29	20	0	0	0	0	0	61
EMPRESS OF THE SEAS	C6SE6	Miami	0	0	0	0	0	0	16	19	7	12	0	0	54
ENDEAVOR	WAUW	New York City	34	26	29	40	38	17	20	39	46	32	0	0	321
ENDURANCE	WDA3359	Valdez	1	2	15	39	31	35	35	36	44	53	0	0	291
ENDURANCE	WAUU	New York City	19	31	23	33	34	37	12	17	12	33	0	0	251
ENTERPRISE	WAUY	New York City	40	26	40	57	34	29	26	32	21	19	0	0	324
EVER DECENT	3FUO7	New York City	5	0	11	0	0	11	4	0	3	0	0	0	34
EVER DEVELOP	3FLF8	New York City	0	0	0	0	0	8	9	3	3	0	0	0	23
EVER DIADEM	3FOF8	New York City	9	2	0	3	0	0	0	1	0	0	0	0	15
EVER DIVINE	3FSA8	Norfolk	11	6	2	8	6	2	6	2	8	4	0	0	55
EVER DYNAMIC	3FUB8	Seattle	3	0	0	6	9	1	7	10	4	10	0	0	50
EVER GRADE	3FOW2	Seattle	13	12	14	8	12	10	10	11	12	13	0	0	115
EVER RACER	3FJL4	New York City	0	8	0	0	7	6	0	4	0	0	0	0	25
EVER REACH	3FQO4	New York City	17	16	18	15	16	4	0	8	20	10	0	0	124
EVER REFINE	3FSB4	New York City	9	21	7	0	0	0	0	0	11	0	0	0	48
EVER RENOWN	3FFR4	Long Beach	0	0	0	0	0	0	0	15	12	16	0	0	43
EVER REPUTE	3FRZ4	New York City	0	34	2	0	0	0	0	0	0	0	0	0	36
SUN ROUND	DYMW	Long Beach	4	10	15	3	0	0	0	0	0	0	0	0	32
EVER UNIFIC	3FGB9	Anchorage	3	0	1	1	0	1	0	0	2	0	0	0	8
EVER UNISON	3FTL6	Seattle	0	1	0	0	0	0	0	0	0	0	0	0	1
EVER URANUS	3FCA9	Seattle	0	0	0	0	0	0	0	0	0	4	0	0	4
EVER URSULA	3FCB9	Seattle	0	0	0	0	1	0	0	8	0	0	0	0	9
EVER USEFUL	3FCC9	Anchorage	0	0	0	0	2	2	0	4	1	0	0	0	9
EVER UTILE	3FZA9	Seattle	0	0	0	0	0	7	0	2	0	0	0	0	9
EXPLORER OF THE SEAS	ELWX5	Miami	270	196	266	444	405	402	466	227	0	0	0	0	2676
FAIRWEATHER	WTEB	Kodiak	0	0	8	35	24	18	8	46	10	9	0	0	158
FALCON ARROW	C6TK8	Anchorage	0	19	74	0	0	0	0	0	0	0	0	0	93
FASCINATION	C6FM9	Miami	0	0	0	0	2	22	24	23	0	0	0	0	71
FEDERAL HUNTER	VRWP2	New Orleans	0	7	48	38	2	0	0	0	0	0	0	0	95
FIDALGO	WUR9616	Kodiak	0	0	0	6	1	0	0	0	0	0	0	0	7
FIGARO	S6PI	Baltimore	0	27	0	20	37	0	0	0	0	54	0	0	138
FISHHAWK	WRB5085	Kodiak	0	0	0	0	24	0	0	5	10	11	0	0	50
FRANCES L	ZCAM5	Baltimore	78	70	78	62	44	24	23	0	0	55	0	0	434
FRANCONIA	3FWI7	Charleston	0	0	0	0	13	9	8	0	0	0	0	0	30
FRED R WHITE JR	WAR7234	Chicago	0	0	0	0	0	0	0	1	0	0	0	0	1
FREDERICK BOUCHARD	WYT9297	Kodiak	0	0	3	0	0	0	0	0	0	0	0	0	3
FREEDOM	WDB5483	Baltimore	0	0	0	0	0	0	36	50	5	37	0	0	128
GALAXY	C6FU6	Miami	10	10	8	13	10	0	0	0	0	0	0	0	51
GALE WIND	WAZ9548	Anchorage	9	9	9	20	14	16	7	9	17	11	0	0	121
GEMINI VOYAGER	C6FE5	Long Beach	30	8	9	13	4	31	48	60	29	39	0	0	271

Ship Name	Call	Port	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
GENE DUNLAP	WAS2433	Kodiak	0	0	0	0	0	0	0	0	0	2	0	0	2
GEYSIR	WCZ5528	Norfolk	70	69	73	64	39	62	51	57	64	67	0	0	616
GLADIATOR	WCZ9000	Kodiak	0	0	0	0	0	3	18	0	0	0	0	0	21
GLOIRE	3FPA6	Seattle	66	56	59	3	76	85	14	84	43	65	0	0	551
GOLDEN BEAR	NMRY	Oakland	0	0	0	0	50	40	74	62	0	0	0	0	226
GORDON GUNTER	WTEO	New Orleans	69	87	60	64	167	117	183	109	0	105	0	0	961
GRAND PRINCESS	ZCBU5	Anchorage	12	13	45	30	2	0	0	0	0	0	0	0	102
GREAT LAND	WFDP	Seattle	33	42	30	11	19	24	38	33	28	36	0	0	294
GREAT PACIFIC	WBD7567	Kodiak	0	0	0	0	0	0	0	3	0	0	0	0	3
GREEN DALE	WCZ5238	Jacksonville	14	2	28	29	15	36	34	33	15	0	0	0	206
GREEN LAKE	WDDI	Baltimore	27	43	41	20	13	32	63	54	70	49	0	0	412
GREEN POINT	WCY4148	New York City	36	30	44	30	53	19	27	28	17	0	0	0	284
GRETA	WCY2853	Kodiak	0	0	0	0	16	0	13	46	18	31	0	0	124
GROTON	KMJL	New York City	12	42	58	23	32	14	23	20	10	3	0	0	237
GSF DEVELOPMENT DRILLER	YJSW5	Houston	0	0	0	0	24	13	12	3	0	0	0	0	52
GSF EXPLORER	WCX5333	New Orleans	52	25	18	89	13	7	1	0	0	0	0	0	205
GUARDIAN	WBO2511	Anchorage	0	0	0	0	0	0	0	0	1	0	0	0	1
GUARDSMAN	WBN5978	Anchorage	0	0	0	0	35	62	36	20	47	13	0	0	213
GULF TITAN	WDA5598	Anchorage	3	18	16	7	3	2	4	7	6	15	0	0	81
GUS W. DARNELL	KCDK	Houston	14	16	13	0	0	19	13	7	7	3	0	0	92
HALLE FOSS	WCF3930	Kodiak	0	0	2	0	2	0	0	0	0	0	0	0	4
HANJIN CHICAGO	DCCN2	Anchorage	25	57	24	54	33	0	0	0	0	0	0	0	193
HANJIN LISBON	DCCM2	Anchorage	28	25	14	11	3	0	0	0	0	0	0	0	81
HANJIN OSAKA	A8FS4	New York City	0	30	55	10	44	44	39	51	52	55	0	0	380
HANJIN OTTAWA	DANM	Anchorage	0	0	0	0	0	12	2	43	13	10	0	0	80
HANJIN PORTLAND	A8FS5	New York City	0	0	0	0	1	9	15	9	7	7	0	0	48
HANJIN SHANGHAI	3FGI5	New York City	21	12	0	0	4	1	2	3	0	22	0	0	65
HANSA CENTURY	DHHI	New York City	1	0	0	0	0	13	28	11	5	0	0	0	58
HANSA NARVIK	DINJ	Anchorage	22	0	38	29	27	0	0	0	0	0	0	0	116
HANSA VISBY	ELWR5	Anchorage	39	37	53	45	48	37	36	59	46	56	0	0	456
HATSU EAGLE	ZNZH6	Seattle	0	0	0	0	0	10	13	15	15	7	0	0	60
HATSU ELITE	VSJG7	Seattle	14	21	17	17	20	17	15	42	24	51	0	0	238
HATSU ENVOY	VSQL9	Seattle	17	27	39	51	37	9	6	10	2	21	0	0	219
HATSU ETHIC	VQFS4	Seattle	51	33	14	15	17	15	10	17	22	7	0	0	201
HATSU EXCEL	VSXV3	Seattle	6	9	10	4	7	6	3	9	17	17	0	0	88
HERBERT C. JACKSON	WL3972	Chicago	0	0	0	1	13	3	0	15	4	7	0	0	43
HERCULES	WBN2074	Anchorage	0	0	0	0	0	7	5	12	25	33	0	0	82
HI'IALAKAI	WTEY	Honolulu	0	16	33	66	68	76	33	65	58	90	0	0	505
HMI BRENTON REEF	WCY8453	Kodiak	37	31	60	74	45	53	37	56	43	48	0	0	484
HONOR	WDC6923	Baltimore	0	0	0	0	0	0	0	0	0	42	0	0	42
HOOD ISLAND	C6LU4	Miami	30	20	20	34	14	13	61	59	52	57	0	0	360
HORIZON ENTERPRISE	KRGB	Oakland	732	190	14	3	41	635	677	227	517	712	0	0	3748
HORIZON ANCHORAGE	KGTX	Anchorage	82	154	191	89	63	201	243	184	263	379	0	0	1849
HORIZON CHALLENGER	WZJC	Jacksonville	65	22	62	65	65	38	48	35	37	76	0	0	513
HORIZON CONSUMER	WCHF	Long Beach	35	56	59	54	50	45	46	35	48	52	0	0	480
HORIZON CRUSADER	WZJF	Jacksonville	44	48	68	75	72	72	81	76	59	51	0	0	646
HORIZON DISCOVERY	WZJD	Jacksonville	49	46	57	50	56	30	0	30	46	56	0	0	420
HORIZON FAIRBANKS	WPGJ	Anchorage	37	47	27	49	49	41	32	37	12	20	0	0	351
HORIZON HAWAII	KIRF	New York City	0	51	69	32	37	57	71	62	67	68	0	0	514
HORIZON KODIAK	KGTZ	Anchorage	48	58	57	60	96	168	69	57	57	58	0	0	728
HORIZON NAVIGATOR	WPGK	Long Beach	35	30	45	39	52	35	41	55	40	57	0	0	429
HORIZON PACIFIC	WSRL	Long Beach	72	80	78	53	66	51	56	58	52	34	0	0	600
HORIZON PRODUCER	WJBJ	New York City	74	68	94	72	74	53	67	77	70	57	0	0	706

VOS Cooperative Ship Report

Ship Name	Call	Port	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
HORIZON RELIANCE	WFLH	Long Beach	71	66	77	83	70	57	65	88	84	84	0	0	745
HORIZON SPIRIT	WFLG	Oakland	62	56	47	42	20	52	35	23	21	27	0	0	385
HORIZON TACOMA	KGTY	Anchorage	91	58	58	58	106	78	58	33	42	46	0	0	628
HORIZON TRADER	KIRH	Oakland	34	0	51	43	55	51	58	53	45	58	0	0	448
HOWARD OLSEN	WDB7214	Kodiak	0	0	0	0	9	3	0	0	0	34	0	0	46
HYUNDAI GARNET	9VVN	New York City	0	0	0	0	0	26	33	58	76	62	0	0	255
IMAGINATION	C6FN2	Miami	0	0	0	0	0	0	1	0	0	0	0	0	1
INDEPENDENCE	WRYG	Baltimore	0	84	55	32	38	0	31	45	31	22	0	0	338
INDIAN OCEAN	C6T2063	New York City	29	22	36	9	3	21	36	35	16	28	0	0	235
INDOTRANS CELEBES	VRZN9	Norfolk	45	13	0	39	15	8	97	28	93	57	0	0	395
INDOTRANS MAKASSA	VRZO2	New Orleans	0	0	0	0	0	0	10	73	52	68	0	0	203
INLAND SEAS	WCJ6214	Chicago	0	0	0	0	1	0	1	0	0	0	0	0	2
INLET RESEARCH	KEC43	Anchorage	1	1	1	1	0	0	1	1	1	0	0	0	7
INSPIRATION	C6FM5	Anchorage	3	5	8	7	10	8	0	0	1	0	0	0	42
INTEGRITY	WDC6925	Baltimore	0	23	44	0	21	0	0	0	0	27	0	0	115
IRENES REMEDY	SYAQ	New York City	0	0	18	9	8	15	17	21	34	45	0	0	167
ISLAND CHAMPION	WCZ7046	Anchorage	0	0	0	0	15	13	2	1	10	1	0	0	42
ISLAND SCOUT	WDC6588	Anchorage	0	0	0	0	0	0	0	0	0	3	0	0	3
ISLAND WARRIOR	WDA9217	Anchorage	0	0	0	0	0	5	7	7	2	16	0	0	37
ITB BALTIMORE	WXKM	Baltimore	0	16	25	0	0	1	1	0	0	0	0	0	43
ITB JACKSONVILLE	WNDG	Baltimore	12	0	11	10	13	88	88	20	30	12	0	0	284
ITB NEW YORK	WVDG	Baltimore	2	5	22	22	10	4	0	13	14	0	0	0	92
IVER FOSS	WYE6442	Kodiak	0	0	0	0	0	14	0	0	0	9	0	0	23
JAG PRAKASH	AUBK	Anchorage	18	0	0	0	0	18	19	22	3	0	0	0	80
JAMES R. BARKER	WYP8657	Chicago	49	0	45	191	180	160	79	85	81	90	0	0	960
JEAN ANNE	WDC3786	New Orleans	0	0	0	0	0	0	45	67	70	42	0	0	224
JEFFREY FOSS	WCX4608	Kodiak	0	0	0	0	0	3	1	0	0	22	0	0	26
JENS MAERSK	OYYK2	New York City	64	43	40	50	33	41	45	34	64	50	0	0	464
JEPPESEN MAERSK	OWTW2	New York City	12	25	11	23	14	8	32	0	36	16	0	0	177
JOHANNES MAERSK	OWFD2	Miami	13	1	17	0	12	14	5	11	20	0	0	0	93
JOHN BRIX	WCY7560	Kodiak	0	1	0	4	3	0	0	0	0	0	0	0	8
JOHN G. MUNSON	WE3806	Chicago	1	0	7	0	0	13	2	0	0	0	0	0	23
JOHN N. COBB	WMVC	Anchorage	0	0	0	7	31	36	3	4	1	0	0	0	82
JOIDES RESOLUTION	D5BC	Norfolk	1	0	0	0	0	0	0	0	0	0	0	0	1
JOSEPH L. BLOCK	WDA2768	Chicago	4	0	0	0	0	0	0	0	0	1	0	0	5
JOSEPH SAUSE	WTW9258	Kodiak	0	0	0	0	0	0	0	0	2	0	0	0	2
JUDY LITRICO	KCKB	New Orleans	42	62	36	39	54	21	41	68	85	36	0	0	484
JUSTINE FOSS	WYL4978	Kodiak	0	19	23	0	7	6	4	0	6	2	0	0	67
JUTUL	LAVX5	Anchorage	0	0	0	6	0	0	0	0	0	0	0	0	6
KAPITAN AFANASYEV	P3XL7	Seattle	0	0	11	0	0	0	47	23	25	0	0	0	106
KAREN MAERSK	OZKN2	Seattle	0	0	0	0	0	0	0	26	63	52	0	0	141
KAUAI	WSRH	Long Beach	40	17	35	42	52	42	23	0	0	26	0	0	277
KAYE E. BARKER	WCF3012	Chicago	11	0	4	24	29	34	52	14	35	0	0	0	203
KEISHO	3FYN4	Seattle	18	0	0	0	0	0	0	0	0	0	0	0	18
KENAI	WSNB	Valdez	9	4	22	27	7	21	18	16	21	25	0	0	170
KENNICOTT	WCY2920	Kodiak	0	0	38	35	24	19	15	12	27	1	0	0	171
KILO MOANA	WDA7827	Honolulu	3	10	12	52	21	15	84	70	1	0	0	0	268
KIRSTEN MAERSK	OYDM2	Seattle	0	0	0	0	0	0	0	36	47	31	0	0	114
KIYI	KAO107	Chicago	0	0	0	0	2	4	1	7	2	4	0	0	20
KNORR	KCEJ	Jacksonville	0	0	0	0	0	33	0	56	78	36	0	0	203
KOTZEBUE RESEARCH	KUU619	Anchorage	0	0	0	0	4	26	26	29	28	26	0	0	139
LAUREN FOSS	WDB3834	Kodiak	0	0	0	0	28	56	70	71	67	82	0	0	374
LEE A. TREGURTHA	WUR8857	Chicago	27	0	14	9	13	1	5	0	0	0	0	0	69
LEGEND OF THE SEAS	C6SL5	Miami	47	49	30	10	0	0	0	0	0	13	0	0	149

Ship Name	Call	Port	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
LEO FOREST	3FPH8	Seattle	0	0	0	0	22	25	35	15	16	0	0	0	113
LESLIE LEE	WYC7933	Kodiak	0	0	0	0	0	0	0	0	0	1	0	0	1
LEYLA KALKAVAN	TCCJ7	Norfolk	0	47	32	29	11	12	8	24	8	0	0	0	171
LIBERTY	WRYX	Baltimore	49	37	47	56	33	37	48	55	54	46	0	0	462
LIBERTY EAGLE	WHIA	Houston	15	44	29	77	46	76	23	43	23	15	0	0	391
LIBERTY GLORY	WADP	New Orleans	42	16	0	0	0	0	47	15	60	42	0	0	222
LIBERTY GRACE	WADN	New Orleans	35	39	0	48	14	19	18	11	41	6	0	0	231
LIBERTY SEA	C6UA5	New Orleans	0	0	0	0	0	55	1	0	18	11	0	0	85
LIBERTY SPIRIT	WCPU	New Orleans	30	0	29	8	1	0	0	8	7	0	0	0	83
LIBERTY STAR	WCBP	New Orleans	43	22	70	121	51	51	48	61	28	33	0	0	528
LIBERTY SUN	WCOB	New Orleans	18	26	21	10	11	29	35	33	7	0	0	0	190
LIHUE	WTST	Oakland	25	38	36	1	45	0	21	37	61	67	0	0	331
LINDA OLDENDORFF	9HCM8	Baltimore	20	19	0	0	0	0	0	0	0	0	0	0	39
LINDEN PRIDE	H3VP	Houston	1	0	0	0	0	0	0	0	0	0	0	0	1
LNG ARIES	V7BW7	New York City	35	30	52	39	2	0	0	0	0	0	0	0	158
LNG CAPRICORN	V7BW8	New York City	29	40	42	15	13	20	20	31	33	49	0	0	292
LNG GEMINI	V7BW9	Kodiak	19	20	23	15	20	9	34	20	23	9	0	0	192
LNG LEO	V7BX2	New York City	13	0	0	22	20	17	34	54	50	31	0	0	241
LNG TAURUS	V7BX4	New York City	36	51	13	16	14	7	3	1	26	24	0	0	191
LNG VIRGO	V7BX5	New York City	4	40	29	21	16	20	17	19	26	20	0	0	212
LOIS H.	WTD4576	Kodiak	0	0	1	0	1	0	1	0	3	0	0	0	6
LT GOING	IBTA	Seattle	0	0	0	0	0	0	0	8	10	12	0	0	30
LT UNICA	IBSM	Seattle	0	0	0	0	0	0	0	1	0	29	0	0	30
LT UNICORN	3FZC9	Seattle	0	0	0	0	0	0	10	0	12	11	0	0	33
LT UNITY	3FCD9	Seattle	1	1	0	1	0	0	0	0	0	0	0	0	3
LT USODIMARE	IBPO	Seattle	0	0	0	0	0	13	0	0	11	0	0	0	24
LTC CALVIN P. TITUS	KJLV	Jacksonville	22	19	5	29	6	3	0	0	0	0	0	0	84
LURLINE	WLVD	Oakland	34	30	35	38	48	30	44	50	38	42	0	0	389
LYKES ACHIEVER	ZCDJ2	New Orleans	0	0	0	21	33	46	0	30	26	0	0	0	156
LYKES MOTIVATOR	WABU	Houston	53	42	73	88	74	41	64	62	81	53	0	0	631
MAASDAM	PFRO	Miami	21	43	38	32	38	0	23	23	20	14	0	0	252
MACKINAC BRIDGE	JKES	New York City	38	52	53	54	59	40	43	42	43	22	0	0	446
MADISON MAERSK	OVJB2	Oakland	20	6	23	19	17	15	15	33	18	0	0	0	166
MAERSK ALASKA	KAKF	Baltimore	0	0	0	0	0	0	0	0	0	4	0	0	4
MAERSK ARIZONA	KAKG	Baltimore	6	0	0	0	3	19	31	32	7	0	0	0	98
MAERSK ARKANSAS	WDB9984	Baltimore	0	0	0	0	5	38	22	2	0	0	0	0	67
MAERSK CAROLINA	WBDS	Charleston	13	79	0	35	16	10	40	28	9	26	0	0	256
MAERSK CONSTELLATION	WRYJ	Houston	35	10	12	4	32	2	31	16	21	0	0	0	163
MAERSK DAMMAM	V2OE3	Oakland	0	0	0	0	0	3	4	10	1	16	0	0	34
MAERSK DOUALA	DCBJ2	Charleston	0	0	11	0	0	0	0	0	0	0	0	0	11
MAERSK DUBLIN	V2OE1	New York City	3	0	2	13	2	0	0	0	0	0	0	0	20
MAERSK GEORGIA	WAHP	New York City	0	7	26	5	6	10	0	41	40	27	0	0	162
MAERSK MISSOURI	WAHV	Norfolk	3	39	30	19	42	9	33	28	11	42	0	0	256
MAERSK NEWARK	A8CF2	New York City	32	31	19	41	57	52	46	1	0	18	0	0	297
MAERSK PECEM	V2OU9	Charleston	0	10	18	35	23	20	21	0	0	0	0	0	127
MAERSK TAIKI	9VIG	Baltimore	5	22	5	2	0	0	0	0	0	0	0	0	34
MAERSK TAIYO	9VJO	Jacksonville	6	0	0	0	0	0	0	0	0	0	0	0	6
MAERSK TEAL	S6HK	Charleston	0	0	0	16	0	0	0	0	0	0	0	0	16
MAERSK TOLEDO	MZOJ8	Seattle	0	5	15	35	33	37	36	0	0	0	0	0	161
MAERSK VALENCIA	DAPG	New York City	68	60	8	6	7	22	19	47	39	29	0	0	305
MAERSK VIRGINIA	WAHK	Norfolk	0	0	0	0	0	0	0	0	0	10	0	0	10
MAERSK WAVE	S6TV	Baltimore	0	0	52	62	58	43	40	49	48	21	0	0	373
MAERSK WIND	S6TY	Baltimore	61	71	93	0	41	58	10	7	22	18	0	0	381

Ship Name	Call	Port	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
MAGLEBY MAERSK	OUSH2	New York City	48	37	46	37	30	42	51	13	7	54	0	0	365
MAHIMAHI	WHRN	Oakland	36	29	0	44	37	38	30	41	4	19	0	0	278
MAIA H.	WYX2079	Kodiak	8	1	3	9	0	0	0	0	0	4	0	0	25
MAJESTIC MAERSK	OUJH2	New York City	34	20	51	12	35	17	44	28	0	23	0	0	264
MANFRED NYSTROM	WCN3590	Kodiak	0	0	0	0	0	0	0	0	22	11	0	0	33
MANOA	KDBG	Oakland	25	54	53	49	59	54	47	53	40	66	0	0	500
MANUKAI	WRGD	New York City	35	37	36	44	32	38	32	18	29	43	0	0	344
MANULANI	WDC4696	New York City	0	0	0	0	0	14	48	37	34	43	0	0	176
MARCY J	WCF4791	Kodiak	0	23	0	0	0	8	0	0	0	0	0	0	31
MAREN MAERSK	OWZU2	Long Beach	34	27	34	23	20	23	57	41	44	50	0	0	353
MARGRETHE MAERSK	OYSN2	Long Beach	16	32	22	23	0	0	36	38	3	11	0	0	181
MARIE MAERSK	OULL2	New York City	54	0	60	0	51	0	41	35	50	51	0	0	342
MARIELLE BOLTEN	ELZH9	New York City	2	0	4	1	29	15	19	7	13	13	0	0	103
MARK HANNAH	WYZ5243	Chicago	0	0	1	3	6	7	10	1	1	1	0	0	30
MARLIN	6ZXG	New Orleans	0	0	0	1	74	63	62	59	29	54	0	0	342
MARTORELL	HPNE	New York City	55	60	60	48	26	74	60	66	28	0	0	0	477
MATANUSKA	WN4201	Kodiak	4	0	0	0	8	0	0	0	0	0	0	0	12
MATHILDE MAERSK	OUUU2	Long Beach	9	29	14	41	18	53	46	75	13	9	0	0	307
MATSONIA	KHRC	Oakland	30	56	47	20	21	19	22	6	29	49	0	0	299
MAUI	WSLH	Long Beach	17	27	36	46	41	32	31	12	25	26	0	0	293
MAUNAWILI	WDB7104	New York City	39	48	43	40	30	24	46	57	50	28	0	0	405
MAYVIEW MAERSK	OWEB2	Oakland	47	23	21	33	27	10	31	36	51	28	0	0	307
MCARTHUR II	WTEJ	Seattle	0	0	0	17	107	103	153	210	180	182	0	0	952
MCKEE SONS	WCZ9703	Chicago	12	0	29	73	87	56	92	93	29	2	0	0	473
MC-KINNEY MAERSK	OUZW2	New York City	19	16	15	20	13	12	22	24	20	16	0	0	177
MEKONG PIONEER	V2JN	Miami	25	35	41	40	33	33	27	66	66	62	0	0	428
MELVILLE	WECB	Long Beach	25	76	89	82	71	56	61	51	21	1	0	0	533
MERCURY	C6SQ6	Miami	8	7	5	3	2	4	13	6	0	0	0	0	48
MERKUR	PJTA	New York City	0	0	0	0	0	0	0	0	625	709	0	0	1334
MESABI MINER	WYQ4356	Chicago	56	0	3	26	45	23	1	24	4	10	0	0	192
METTE MAERSK	OXKT2	Long Beach	0	4	32	28	18	54	51	47	36	43	0	0	313
MICHIGAN	WRB4141	Chicago	0	0	0	0	0	0	2	0	1	0	0	0	3
MIDDLETOWN	WR3225	Chicago	0	0	0	0	0	0	0	62	24	1	0	0	87
MIDNIGHT SUN	WAHG	Seattle	56	83	66	100	85	72	81	54	64	66	0	0	727
MIKI HANA	WTW9252	Kodiak	2	2	0	0	1	0	0	0	0	0	0	0	5
MILLER FREEMAN	WTDM	Seattle	0	52	102	87	149	103	146	133	124	130	0	0	1026
MOBILE	KXDB	New York City	0	0	0	0	4	34	15	2	1	13	0	0	69
MOKIHANA	WNRD	Oakland	50	72	64	30	33	40	25	33	40	44	0	0	431
MOKU PAHU	WBWK	Oakland	14	26	8	42	33	46	54	0	17	27	0	0	267
MOL COMMITMENT	9VID2	Charleston	32	36	45	33	34	1	4	0	0	0	0	0	185
MOL EFFICIENCY	HOZY	Anchorage	48	28	20	1	0	0	0	0	0	0	0	0	97
MOL INNOVATION	9VVP	Oakland	18	22	42	11	29	18	9	0	0	28	0	0	177
MOL THAMES	3EFV8	Norfolk	0	0	0	0	0	14	13	12	8	0	0	0	47
MOL VELOCITY	9VVK	Seattle	37	17	40	41	40	35	30	57	26	53	0	0	376
MONTAUK	WDCJ	New Orleans	37	26	9	2	7	9	61	75	88	49	0	0	363
MSC DIEGO	3FZP8	New York City	0	0	0	0	0	0	19	18	13	17	0	0	67
MSC DONATA	A8EU2	Anchorage	26	34	38	27	34	31	34	37	25	37	0	0	323
MSC MATILDE	HODP	New York City	34	29	9	6	4	6	2	16	5	4	0	0	115
NANCY FOSTER	WTER	Norfolk	10	65	34	43	43	42	50	79	43	25	0	0	434
NANUQ	WCY8498	Valdez	0	0	1	2	2	3	0	3	1	0	0	0	12
NATOMA	WBB5799	Kodiak	0	1	0	0	0	0	1	0	0	0	0	0	2
NAVAJO	WCT5737	Kodiak	15	11	6	19	9	4	3	0	0	0	0	0	67
NAVIGATOR	WBO3345	Anchorage	2	0	42	0	0	0	0	0	0	40	0	0	84
NAVIGATOR OF THE SEAS	C6FU4	Miami	12	23	1	18	2	20	8	1	0	26	0	0	111

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NEW HORIZON	WKWB	Long Beach	6	37	49	35	0	10	39	46	15	0	0	0	237
NOAA SHIP KA'IMIMOANA	WTEU	Honolulu	0	29	77	49	30	57	104	62	102	49	0	0	559
NORASIA ANDES	A8FA4	New York City	0	0	0	0	0	0	1	0	0	0	0	0	1
NORASIA ATLAS	A8GX4	New York City	6	57	48	24	17	9	21	14	6	7	0	0	209
NORASIA SILS	HBDF	New York City	0	0	0	0	0	0	18	28	14	32	0	0	92
NORDEAGLE	P3KE8	New York City	0	9	29	19	0	0	0	0	0	0	0	0	57
NORTH STAR	KIYI	Seattle	53	59	49	42	56	66	59	60	106	96	0	0	646
NORTHERN VICTOR	WCZ6534	Kodiak	4	3	5	3	0	7	0	0	0	13	0	0	35
NORTHWEST EXPLORER	WCZ9007	Kodiak	0	0	0	0	0	0	2	0	0	0	0	0	2
NORWEGIAN DREAM	C6LG5	New Orleans	9	12	8	0	10	0	0	0	0	0	0	0	39
NORWEGIAN SEA	C6DM2	Houston	10	12	16	21	21	9	0	0	0	0	0	0	89
NOVA TERRA	C6IZ7	Miami	27	32	19	20	0	0	0	14	24	57	0	0	193
NUNANIQ	WRC2049	Anchorage	0	0	0	0	0	0	0	0	0	19	0	0	19
OCEAN AMERICA	WSWM	Houston	0	0	0	0	0	0	33	2	5	0	0	0	40
OCEAN CONFIDENCE	V7EA2	Houston	0	0	0	0	0	8	40	14	6	0	0	0	68
OCEAN MARINER	WCF3990	Anchorage	0	0	0	3	0	0	0	0	9	7	0	0	19
OCEAN NAVIGATOR	WSC2552	Anchorage	0	0	0	0	0	0	0	0	1	0	0	0	1
OCEAN PREFACE	VRUL7	New Orleans	15	10	10	5	0	0	3	0	2	0	0	0	45
OCEAN RANGER	WAM7635	Anchorage	0	0	0	29	14	3	26	0	7	42	0	0	121
OCEAN RELIANCE	WADY	Kodiak	16	21	23	15	3	17	4	21	7	1	0	0	128
OCEAN SERVICE	WTW9263	Kodiak	0	1	0	0	0	0	0	0	0	0	0	0	1
OCEAN STAR	V7EB6	Houston	0	0	0	0	0	0	4	0	0	0	0	0	4
OCEAN TITAN	WDB9647	Anchorage	0	13	5	4	1	3	2	1	0	2	0	0	31
OCEAN TITAN	WDC7175	Jacksonville	0	0	0	0	0	0	0	0	0	21	0	0	21
OCEAN VALIANT	V7EB7	Houston	0	0	0	0	0	0	62	26	1	0	0	0	89
OCEAN VICTORY	V7EB8	Kodiak	2	0	0	0	0	0	0	0	0	0	0	0	2
OGLEBAY NORTON	WAQ3521	Chicago	0	0	0	0	0	0	24	16	29	21	0	0	90
OLEANDER	PJJU	New York City	12	1	16	9	3	0	8	4	8	13	0	0	74
OLGA MAERSK	OXBB2	New York City	14	19	19	10	8	0	0	1	0	0	0	0	71
OLIVIA MAERSK	OXKO2	Miami	29	6	6	37	16	30	44	13	40	48	0	0	269
OLUF MAERSK	OXFU2	New York City	21	37	17	0	0	0	0	0	0	0	0	0	75
OLYMPIAN HIGHWAY	3FSH4	Seattle	0	0	0	13	18	0	0	4	1	0	0	0	36
OOCL AMERICA	VRWE8	Seattle	10	15	20	12	2	16	17	15	8	17	0	0	132
OOCL ATLANTA	VRAR6	Anchorage	0	0	0	1	50	72	67	81	67	79	0	0	417
OOCL CALIFORNIA	VRWC8	Seattle	54	30	40	22	31	16	28	31	21	31	0	0	304
OOCL FAIR	VRWB8	Long Beach	25	7	14	9	6	9	9	15	26	31	0	0	151
OOCL FIDELITY	VRWG5	Long Beach	12	6	27	14	24	13	24	18	24	7	0	0	169
OOCL FRIENDSHIP	VRWD3	Long Beach	0	0	0	28	25	35	34	46	38	1	0	0	207
OOCL LONG BEACH	VRY04	Anchorage	0	0	0	0	2	0	0	0	0	0	0	0	2
OOCL NETHERLANDS	VRVN6	Long Beach	0	7	35	30	38	11	33	39	33	25	0	0	251
OOCL TIANJIN	VRAR7	Anchorage	0	0	0	0	0	0	53	50	36	30	0	0	169
OOSTERDAM	PBKH	Anchorage	3	2	0	0	0	0	0	0	0	34	0	0	39
ORANGE STAR	ELFS7	New York City	0	0	89	87	80	69	91	89	95	83	0	0	683
OREGON II	WTDO	New Orleans	43	142	149	73	48	70	65	102	0	41	0	0	733
ORIENTE SHINE	H9AL	Seattle	30	20	16	17	11	24	11	0	0	0	0	0	129
ORIENTE VICTORIA	3FVG8	Seattle	42	40	0	0	0	0	0	0	0	0	0	0	82
ORION VOYAGER	C6MC5	Baltimore	0	0	67	91	70	25	50	58	55	17	0	0	433
OSCAR DYSON	WTEP	Kodiak	0	0	0	0	0	0	158	166	68	0	0	0	392
OSCAR ELTON SETTE	WTEE	Jacksonville	32	44	25	27	18	49	55	59	24	53	0	0	386
OURO DO BRASIL	ELPP9	Baltimore	22	17	33	21	1	0	0	0	0	35	0	0	129
OVERSEAS CHICAGO	KBCF	Valdez	4	26	30	8	0	28	0	0	0	0	0	0	96
OVERSEAS HARRIETTE	WRFJ	Houston	1	0	20	53	70	73	20	7	2	0	0	0	246
OVERSEAS JOYCE	WUQL	Jacksonville	28	19	20	13	13	11	16	26	26	18	0	0	190
OVERSEAS MARILYN	WFQB	Houston	0	0	0	0	30	11	17	0	0	29	0	0	87

Ship Name	Call	Port	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
OVERSEAS NEW ORLEANS	WFKW	Houston	41	31	27	38	41	39	43	40	35	31	0	0	366
OVERSEAS NEW YORK	WMCK	Valdez	22	22	23	9	10	5	12	0	2	6	0	0	111
OVERSEAS PHILADELPHIA	WGDB	Miami	0	0	0	0	5	10	13	4	0	0	0	0	32
OVERSEAS WASHINGTON	WFGV	Valdez	20	20	38	22	7	0	0	27	2	0	0	0	136
P&O NEDLLOYD ANDES	ELYY5	Anchorage	0	10	79	67	33	12	0	0	16	10	0	0	227
P&O NEDLLOYD VERA CRUZ	WDC2886	Houston	0	34	55	32	15	0	0	2	0	0	0	0	138
PACIFIC AVENGER	WCY8175	Kodiak	1	31	7	5	100	3	0	0	0	0	0	0	147
PACIFIC CHALLENGER	WDA3588	Kodiak	324	287	122	0	0	4	73	34	76	190	0	0	1110
PACIFIC FREEDOM	WDJF	Kodiak	0	0	0	2	12	0	0	0	0	0	0	0	14
PACIFIC PATRIOT	WDB6493	Kodiak	40	0	26	51	24	30	122	8	80	25	0	0	406
PACIFIC RAVEN	WDB7583	Kodiak	67	33	95	173	258	152	194	257	179	194	0	0	1602
PACIFIC STAR	WCW7740	Kodiak	0	1	0	0	0	0	0	0	0	0	0	0	1
PANDALUS	WAV7611	Anchorage	0	0	0	0	0	1	0	0	0	0	0	0	1
PARAGON	WDA2311	Kodiak	41	9	149	130	88	62	112	83	68	44	0	0	786
PATHFINDER	WBN8467	Valdez	5	0	2	1	1	0	15	9	8	2	0	0	43
PATRIOT	NL9WX	Kodiak	36	10	0	1	0	0	0	0	0	0	0	0	47
PATRIOT	WQVY	Baltimore	0	39	38	37	23	33	29	29	12	0	0	0	240
PAUL R. TREGURTHA	WYR4481	Chicago	33	0	6	60	67	78	63	94	130	91	0	0	622
PERSEVERANCE	WSKH	Houston	4	0	0	0	8	9	0	0	8	0	0	0	29
PHILADELPHIA	KSYP	Miami	0	0	0	1	39	33	27	34	36	22	0	0	192
PHOENIX VOYAGER	C6QE3	Oakland	19	5	17	16	7	13	10	9	32	33	0	0	161
PHYLLIS DUNLAP	WDA6552	Kodiak	0	20	18	77	3	47	0	21	61	45	0	0	292
PITTSBURG	ELTQ6	Baltimore	56	55	58	22	0	0	0	0	0	0	0	0	191
POINT BARROW	WBM5088	Anchorage	0	0	0	0	13	18	11	5	0	20	0	0	67
POLAR ADVENTURE	WAZV	New Orleans	30	18	49	32	27	17	27	6	21	45	0	0	272
POLAR ALASKA	KSBK	Valdez	48	37	8	12	40	40	14	15	19	27	0	0	260
POLAR CALIFORNIA	WMCV	Long Beach	21	17	21	25	5	62	34	20	13	25	0	0	243
POLAR DISCOVERY	WACW	New Orleans	23	11	8	27	20	28	33	22	21	14	0	0	207
POLAR EAGLE	ELPT3	Anchorage	145	168	186	211	1	162	169	174	258	372	0	0	1846
POLAR ENDEAVOUR	WCAJ	New Orleans	10	9	11	29	20	27	20	18	8	16	0	0	168
POLAR RESOLUTION	WDJK	New Orleans	36	44	69	78	20	39	7	0	3	6	0	0	302
POWHATAN	WCZ5243	Kodiak	0	0	0	6	0	0	0	0	0	0	0	0	6
PREMIUM DO BRASIL	A8BL4	Baltimore	7	19	12	12	0	5	0	0	0	10	0	0	65
PRESIDENT ADAMS	WRYW	Long Beach	67	65	65	60	43	53	81	65	61	42	0	0	602
PRESIDENT GRANT	WCY2098	Long Beach	43	53	61	49	42	30	47	51	67	48	0	0	491
PRESIDENT JACKSON	WRYC	Long Beach	36	38	37	45	43	32	48	62	66	60	0	0	467
PRESIDENT POLK	WRYD	Long Beach	71	52	49	26	43	72	80	49	29	64	0	0	535
PRESIDENT TRUMAN	WNDP	Long Beach	31	52	12	11	54	28	28	26	62	46	0	0	350
PRESIDENT WILSON	WCY3438	Long Beach	41	42	38	32	20	36	7	26	41	50	0	0	333
PRESQUE ISLE	WZE4928	Chicago	19	0	0	4	33	34	0	18	19	6	0	0	133
PRIDE OF BALTIMORE II	WUW2120	Baltimore	0	0	1	16	64	41	57	52	9	0	0	0	240
PRINCE WILLIAM SOUND	WSDX	Valdez	12	13	12	31	2	1	0	0	0	0	0	0	71
PT. THOMPSON	WBN5092	Anchorage	0	0	0	0	0	0	0	0	1	41	0	0	42
PURITAN	ZCDH9	Miami	45	48	49	19	7	8	23	16	11	32	0	0	258
PUSAN SENATOR	DQVG	Seattle	23	14	1	10	1	5	12	2	24	20	0	0	112
PYXIS LEADER	H9ML	Jacksonville	0	0	0	0	0	0	74	91	43	0	0	0	208
R.J. PFEIFFER	WRJP	Long Beach	1	8	43	32	10	0	15	36	23	8	0	0	176
R.V. DAY	WS6709	Kodiak	0	0	1	0	0	0	0	0	0	0	0	0	1
R/V ENDEAVOR	WCE5063	New York City	0	0	0	0	0	0	0	0	0	13	0	0	13
RAINIER	WTEF	Seattle	0	0	20	76	30	49	49	74	69	51	0	0	418
RANGER	WBN5979	Seattle	0	0	5	3	11	1	0	0	0	0	0	0	20

Ship Name	Call	Port	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
REBECCA LYNN	WCW7977	Chicago	0	0	0	0	2	2	3	2	7	2	0	0	18
RED DOG	KYU625	Kodiak	0	0	0	0	0	0	0	19	79	28	0	0	126
REDEEMER	WDA8432	Kodiak	0	0	0	0	0	0	0	0	0	10	0	0	10
REDOUBT	WCG3013	Anchorage	0	0	0	0	17	3	10	0	4	0	0	0	34
REGAL PRINCESS	ZCBU4	Anchorage	0	3	24	12	4	0	9	3	0	0	0	0	55
REGULUS VOYAGER	C6FE6	Oakland	47	40	5	8	46	35	25	15	36	37	0	0	294
RESERVE	WE7207	Chicago	0	0	0	0	0	0	0	0	0	1	0	0	1
RESOLUTION	WBR6941	Kodiak	0	0	0	0	0	1	3	0	0	1	0	0	5
RESOLVE	WCZ5535	Baltimore	5	27	18	14	1	8	7	4	6	17	0	0	107
RHAPSODY OF THE SEAS	C6UA2	Houston	0	0	0	5	25	16	5	34	12	29	0	0	126
RHINE FOREST	V7EI9	New Orleans	26	24	39	42	63	41	57	29	0	0	0	0	321
RICKMERS HAMBERG	V7DS3	New Orleans	16	4	2	1	0	0	0	0	0	3	0	0	26
RIO GALLEGOS I	HODT	Seattle	5	3	5	0	0	0	0	0	0	0	0	0	13
ROBERT C. SEAMENS	WDA4486	Kodiak	1	11	30	43	10	14	0	0	0	0	0	0	109
ROGER BLOUGH	WZP8164	Chicago	9	0	0	0	5	5	3	0	0	0	0	0	22
ROGER REVELLE	KAOU	New Orleans	65	52	62	83	60	56	65	65	84	15	0	0	607
RONALD H. BROWN	WTEC	New Orleans	57	70	62	0	0	0	51	71	72	56	0	0	439
ROTTERDAM	PDGS	Anchorage	21	73	37	4	13	27	19	35	11	54	0	0	294
ROUGHNECK	WTW9262	Kodiak	2	0	6	2	2	6	0	0	0	0	0	0	18
ROYAL PRINCESS	GBRP	Long Beach	0	0	1	5	0	0	0	0	0	0	0	0	6
RUBIN ARTEMIS	3FAH7	Seattle	4	19	15	22	27	38	28	22	0	0	0	0	175
RUBIN PEARL	YJQA8	Seattle	49	14	65	44	46	31	0	0	28	71	0	0	348
RUFF & REDDY	WY4096	Kodiak	1	0	1	0	1	0	0	0	0	0	0	0	3
RYNDAM	PHFV	Miami	4	2	13	11	10	0	0	0	4	38	0	0	82
S/R BAYTOWN	KFPM	Valdez	0	28	15	0	3	18	15	8	8	4	0	0	99
S/R COLUMBIA BAY	WFQE	Long Beach	9	0	1	2	0	2	4	0	6	9	0	0	33
S/R LONG BEACH	WHCA	Long Beach	1	3	0	0	0	0	0	0	0	0	0	0	4
S/R PUGET SOUND	WXBZ	Valdez	0	0	0	3	5	0	0	0	0	1	0	0	9
S/R WILMINGTON	WBVZ	Houston	0	1	0	0	3	7	12	1	0	0	0	0	24
SAFMARINE ZAMBEZI	A8CE9	New York City	55	30	14	11	2	11	0	0	0	0	0	0	123
SAKURA	V2AK3	New York City	0	0	0	0	0	0	21	33	22	19	0	0	95
SALLY MAERSK	OZHS2	Seattle	45	3	1	0	0	11	6	0	69	0	0	0	135
SAM M. TAALAK	WCX5321	Kodiak	0	0	0	0	1	17	5	26	45	27	0	0	121
SAMSON MARINER	WCN3586	Kodiak	10	5	10	2	8	12	11	14	4	14	0	0	90
SANDRA FOSS	WYL4908	Kodiak	0	0	0	0	0	20	3	0	1	11	0	0	35
SANTA BARBARA	MGYF6	Seattle	0	0	0	28	12	26	46	40	49	68	0	0	269
SARGASSO	H9YR	Houston	0	0	0	0	0	0	0	0	0	1	0	0	1
SAUDI ABHA	HZRX	Baltimore	7	51	32	19	12	19	2	31	23	2	0	0	198
SAUDI DIRIYAH	HZZB	Houston	18	3	52	35	9	39	2	0	0	0	0	0	158
SAUDI HOFUF	HZZC	Houston	31	39	44	15	11	8	14	20	11	9	0	0	202
SAUDI TABUK	HZZD	Houston	68	27	51	62	58	14	0	33	5	57	0	0	375
SCAN RESOLUTION	LAGA6	New York City	15	0	23	0	0	0	0	0	0	0	0	0	38
SCHACKENBORG	ZCIH7	Houston	7	28	68	68	38	6	34	42	37	0	0	0	328
SEA HAWK	WDA3282	Kodiak	0	0	0	17	0	9	0	0	0	0	0	0	26
SEA PRINCE	WYT8569	Anchorage	20	74	22	18	59	82	121	85	62	106	0	0	649
SEA RANGER	WBM8733	Anchorage	0	0	0	0	18	15	11	24	12	19	0	0	99
SEA RELIANCE	WEOB	Kodiak	8	3	4	0	0	0	0	0	0	0	0	0	15
SEA STORM	WCV9132	Kodiak	0	0	0	0	0	1	0	0	0	0	0	0	1
SEA VENTURE	WCC7684	Anchorage	0	0	0	0	0	1	18	0	0	0	0	0	19
SEA VICTORY	WCY6777	Anchorage	0	0	0	0	0	12	48	0	0	0	0	0	60
SEA VIKING	WCE8951	Anchorage	0	0	0	7	22	34	16	25	2	0	0	0	106
SEA VOYAGER	WCX9106	Valdez	40	43	54	51	50	51	48	11	0	0	0	0	348
SEABULK AMERICA	WWYY	Kodiak	0	0	0	0	55	28	0	4	87	56	0	0	230
SEABULK ARCTIC	WCY7054	Kodiak	25	17	17	22	33	26	25	16	31	30	0	0	242

Ship Name	Call	Port	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
SEABULK MONTANA	WCW9126	Anchorage	223	99	105	109	108	105	131	105	125	128	0	0	1238
SEABULK PRIDE	WCY7052	Kodiak	16	25	33	38	67	24	18	42	36	27	0	0	326
SEABULK TRADER	KNJK	Miami	22	38	32	36	26	30	31	16	3	5	0	0	239
SEA-LAND ACHIEVER	WPKD	Houston	55	65	48	48	71	72	41	27	18	16	0	0	461
SEA-LAND ATLANTIC	KRLZ	Houston	48	38	32	52	104	71	45	43	89	52	0	0	574
SEA-LAND CHAMPION	MCDZ2	Oakland	28	17	2	18	23	0	21	23	38	59	0	0	229
SEA-LAND COMET	WDB9950	Norfolk	39	65	50	42	15	38	43	30	44	32	0	0	398
SEA-LAND COMMITMENT	KRPB	Houston	55	61	55	54	60	29	53	8	101	57	0	0	533
SEA-LAND DEFENDER	KGJB	Oakland	82	51	77	36	0	0	0	0	0	0	0	0	246
SEA-LAND DEVELOPER	V7HZ7	Seattle	0	0	0	0	0	0	0	0	0	16	0	0	16
SEA-LAND DEVELOPER	KHRH	Houston	33	1	63	59	12	0	0	0	0	0	0	0	168
SEA-LAND EAGLE	MCDZ9	Long Beach	0	0	15	30	14	39	24	23	17	14	0	0	176
SEA-LAND ENDURANCE	V7HX3	Seattle	0	0	0	2	19	9	10	0	6	0	0	0	46
SEA-LAND EXPRESS	V7HH7	Long Beach	468	415	4	38	14	1	2	0	0	0	0	0	942
SEA-LAND FLORIDA	KRHX	Houston	98	62	69	87	75	62	74	66	119	99	0	0	811
SEA-LAND FREEDOM	V7AM3	Norfolk	1	39	48	27	0	0	0	0	0	0	0	0	115
SEA-LAND INDEPENDENCE	WGJC	Long Beach	23	27	26	61	2	0	0	0	0	0	0	0	139
SEA-LAND INNOVATOR	V7IA8	Seattle	55	91	105	68	5	6	0	0	0	0	0	0	330
SEA-LAND INTEGRITY	V7IP8	Houston	292	371	440	453	236	27	18	0	0	38	0	0	1875
SEA-LAND INTREPID	WDB9949	Charleston	25	11	11	1	18	4	1	31	12	8	0	0	122
SEA-LAND LIBERATOR	KHRP	Oakland	52	26	52	68	44	33	46	88	64	4	0	0	477
SEA-LAND MARINER	V7AM5	New York City	23	37	24	37	19	0	0	0	0	0	0	0	140
SEA-LAND MERCURY	MCDW9	Oakland	71	67	43	32	36	29	49	37	59	29	0	0	452
SEA-LAND METEOR	WDB9951	Miami	15	22	15	18	28	35	48	35	36	41	0	0	293
SEA-LAND MOTIVATOR	WAAH	Houston	47	64	96	98	117	80	87	41	89	91	0	0	810
SEA-LAND PATRIOT	V7IP7	Oakland	54	77	59	64	85	50	45	26	0	0	0	0	460
SEA-LAND PERFORMANCE	KRPD	Houston	18	31	24	51	34	34	35	58	72	50	0	0	407
SEA-LAND PRIDE	WDB9444	Houston	97	83	167	91	57	162	111	9	55	83	0	0	915
SEA-LAND QUALITY	KRNJ	Houston	12	29	36	66	74	49	52	26	78	50	0	0	472
SEA-LAND RACER	MCDW2	Charleston	23	23	0	0	0	0	0	0	0	0	0	0	46
SEA-LAND VOYAGER	KHRK	Long Beach	133	56	97	65	25	0	0	0	0	0	0	0	376
SELMA KALKAVAN	V7GX5	Norfolk	23	55	59	68	53	33	18	47	39	54	0	0	449
SENECA	WBN8469	Anchorage	0	0	0	0	51	59	14	54	25	16	0	0	219
SIDNEY FOSS	WYL5445	Kodiak	35	31	32	31	14	27	8	12	3	11	0	0	204
SIKU	WCQ6174	Anchorage	0	0	0	0	0	0	0	0	0	2	0	0	2
SILKEBORG	EIJV	Houston	0	0	30	41	27	23	76	44	39	71	0	0	351
SINE MAERSK	OZOK2	Seattle	0	0	49	0	16	7	0	8	0	16	0	0	96
SINUK	WCQ8110	Anchorage	0	0	0	85	120	127	141	119	145	139	0	0	876
SIOUX	WBN7617	Anchorage	0	0	0	0	0	0	0	31	86	56	0	0	173
SKAGEN MAERSK	OYOS2	Seattle	0	0	0	0	0	0	0	3	0	0	0	0	3
SKANDERBORG	ZCIG4	Houston	23	0	0	0	12	40	0	0	0	0	0	0	75
SKODSBORG	ZCIJ7	Baltimore	26	5	9	16	13	7	52	40	0	22	0	0	190
SNOHOMISH	WSQ8098	Kodiak	0	0	0	0	12	9	1	1	0	0	0	0	23
SOFIE MAERSK	OZUN2	Seattle	0	52	4	15	48	0	26	3	9	41	0	0	198
SOL DO BRASIL	ELQQ4	Baltimore	0	4	5	9	13	16	20	20	28	7	0	0	122
SOROE MAERSK	OYKJ2	Seattle	33	0	41	12	1	35	0	10	11	0	0	0	143
SOUND RELIANCE	WXAE	Kodiak	6	140	23	36	5	29	9	7	0	9	0	0	264
SPIRIT OF OCEANUS	C6PJ8	Kodiak	0	0	0	0	0	2	2	0	0	0	0	0	4
SS BADGER	WBD4889	Chicago	0	0	0	0	0	8	7	5	5	3	0	0	28
ST PAUL RESEARCH	KEY796	Anchorage	0	3	6	1	0	0	0	0	0	0	0	0	10
ST. MARYS CHALLENGER	WDB9135	Chicago	3	0	0	0	0	0	8	19	17	12	0	0	59
STACEY FOSS	WYL4909	Kodiak	0	0	0	0	0	11	0	0	0	26	0	0	37

Ship Name	Call	Port	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
STAR ALABAMA	LAVU4	Baltimore	42	61	36	39	27	35	24	30	0	38	0	0	332
STAR AMERICA	LAVV4	Jacksonville	10	24	22	24	15	0	8	0	0	13	0	0	116
STAR EAGLE	LAWO2	Baltimore	31	24	0	0	24	22	46	0	20	46	0	0	213
STAR EVVIVA	LAHE2	Jacksonville	20	30	28	26	17	39	11	12	0	6	0	0	189
STAR FLORIDA	LAVW4	Houston	0	0	0	24	26	1	9	29	13	0	0	0	102
STAR GEIRANGER	LAKQ5	Seattle	0	34	26	0	26	32	0	0	0	52	0	0	170
STAR GRAN	LADR4	Long Beach	0	19	19	15	23	0	0	0	0	0	0	0	76
STAR GRINDANGER	LAKR5	Seattle	20	0	0	0	0	0	13	23	47	35	0	0	138
STAR HANSA	LAXP4	Jacksonville	0	0	41	12	25	32	4	30	26	0	0	0	170
STAR HARMONIA	LAGB5	Baltimore	35	50	15	21	18	36	70	35	12	51	0	0	343
STAR HERDLA	LAVD4	Baltimore	6	0	0	19	18	0	37	22	28	35	0	0	165
STAR HIDRA	LAVN4	Baltimore	13	0	5	0	18	15	0	0	3	0	0	0	54
STAR INDIANA	S6BE	Baltimore	33	22	24	14	11	0	0	0	0	0	0	0	104
STAR ISMENE	LANT5	Baltimore	32	28	23	24	0	0	18	9	25	28	0	0	187
STAR ISTIND	LAMP5	Houston	0	0	15	9	13	6	16	4	21	38	0	0	122
STAR JAPAN	LAZV5	Baltimore	1	54	39	36	87	0	47	39	45	23	0	0	371
STAR JUVENTAS	LAZU5	Baltimore	0	0	0	0	0	0	1	0	0	0	0	0	1
STATENDAM	PHSG	Miami	23	42	27	15	0	0	3	1	36	77	0	0	224
STELLAR VOYAGER	C6FV4	Seattle	3	3	2	3	0	0	0	0	0	0	0	0	11
STEWART J. CORT	WDC6055	Chicago	5	0	1	9	12	10	0	17	30	28	0	0	112
STIMSON	KF002	Kodiak	33	14	11	20	19	20	19	0	0	96	0	0	232
STRONG PATRIOT	WCZ8589	Norfolk	1	11	3	14	42	23	35	54	62	63	0	0	308
SUMIDA	3FMX7	New York City	0	0	0	4	13	9	140	227	223	204	0	0	820
SUN RIGHT	DYMS	Long Beach	0	0	0	1	0	0	0	0	0	0	0	0	1
SUNBELT SPIRIT	V7DK4	New York City	0	0	0	0	1	4	18	17	18	12	0	0	70
SUSAN MAERSK	OYIK2	Seattle	47	0	12	1	0	15	0	10	9	0	0	0	94
SUSAN W. HANNAH	WAH9146	Chicago	0	0	0	0	6	2	0	0	0	0	0	0	8
SVEND MAERSK	OYJS2	Seattle	27	20	0	51	0	20	14	0	47	0	0	0	179
SWIFT ARROW	C6NI7	Anchorage	12	46	32	22	31	20	6	37	38	25	0	0	269
SYNERGY	NL9H	Kodiak	0	0	46	50	68	84	77	55	17	50	0	0	447
T/V ENTERPRISE	KVMU	New York City	67	76	0	0	0	0	0	0	0	0	0	0	143
T/V STATE OF MAINE	WCAH	Charleston	0	0	0	0	158	80	0	0	14	0	0	0	252
TAIO FRONTIER	3EZF5	Anchorage	27	50	55	29	17	0	22	0	22	3	0	0	225
TALISMAN	LAOW5	Jacksonville	12	0	1	36	20	0	0	17	16	0	0	0	102
TAMESIS	LAOL5	Norfolk	0	10	0	0	8	10	0	18	0	0	0	0	46
TAMPA	LMWO3	Baltimore	33	19	16	0	29	23	14	0	28	37	0	0	199
TAN'ERLIQ	WCY8497	Valdez	0	2	7	0	2	7	2	7	3	0	0	0	30
TAUSALA SAMOA	V2FA2	Long Beach	34	25	55	46	35	36	34	8	0	0	0	0	273
TENACIOUS	WTK2123	Kodiak	1	0	0	0	0	0	1	0	3	0	0	0	5
TEXAS CLIPPER II	KVWA	Houston	0	0	0	0	0	39	32	0	0	0	0	0	71
THOMAS G. THOMPSON	KTDQ	Seattle	0	0	0	10	106	109	32	43	61	19	0	0	380
THOMAS JEFFERSON	WTEA	Norfolk	0	0	0	0	12	6	0	0	50	43	0	0	111
TIGER	WCE2134	Kodiak	0	0	1	0	0	0	0	0	0	0	0	0	1
TIGLAX	WZ3423	Anchorage	0	0	0	0	1	2	2	18	6	0	0	0	29
TITAN	WAW9232	Kodiak	15	9	5	9	9	4	0	0	0	0	0	0	51
TONSINA	KJDG	Valdez	0	15	30	0	0	0	0	0	0	0	0	0	45
TOURCOING	9V6488	Norfolk	0	0	0	0	0	0	0	0	43	0	0	0	43
TREIN MAERSK	MSQQ8	Baltimore	23	22	30	23	36	2	26	9	23	10	0	0	204
TUSTUMENA	WNGW	Kodiak	99	90	17	21	19	13	22	19	24	21	0	0	345
TYCO DECISIVE	V7DI7	Baltimore	0	0	0	0	0	0	0	48	54	0	0	0	102
TYCO DURABLE	V7DI8	Baltimore	0	54	1	43	72	0	21	0	0	0	0	0	191
TYCO RESPONDER	V7CY9	Baltimore	3	0	0	0	0	0	0	0	0	0	0	0	3
TYCOM RELIANCE	V7CZ2	Baltimore	0	0	0	0	0	0	0	0	0	4	0	0	4
TYONEK	WMH8	Anchorage	0	0	0	0	0	0	1	1	0	0	0	0	2

VOS Cooperative Ship Report

Ship Name	Call	Port	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
UBC SAIKI	P3GY9	Seattle	32	13	163	36	39	17	36	73	63	56	0	0	528
UBC SVEA	P3JA8	Seattle	21	30	31	38	56	27	35	22	23	39	0	0	322
UNITED SPIRIT	ELYB2	Seattle	39	73	68	43	72	65	60	78	84	76	0	0	658
USCGC ACUSHNET WMEC 167	NNHA	Kodiak	1	0	0	0	0	0	0	0	0	0	0	0	1
USCGC EAGLE	NRCB	Kodiak	0	0	0	0	11	0	4	0	0	0	0	0	15
USCGC HEALY	NEPP	Seattle	0	0	0	0	12	113	148	88	117	90	0	0	568
USCGC MACKINAW	NRKP	Chicago	5	0	3	0	0	0	3	1	1	2	0	0	15
USCGC MAPLE (WLB 207)	NWBE	Kodiak	0	0	0	0	0	0	0	4	16	8	0	0	28
USCGC POLAR STAR	NBTM	Seattle	42	143	45	0	0	0	0	0	0	0	0	0	230
USCGC SPAR	NJAR	Kodiak	1	13	0	1	0	0	0	0	0	0	0	0	15
VALDEZ RESEARCH	WXJ63	Valdez	0	0	0	0	0	0	124	230	226	235	0	0	815
VALENCIA BRIDGE	HOUU	Anchorage	46	56	54	60	59	39	64	67	64	65	0	0	574
VANCOUVER BRIDGE	H8FE	Seattle	0	5	19	17	12	17	7	12	14	0	0	0	103
VEENDAM	C6NL6	Miami	20	0	0	0	0	1	0	0	3	19	0	0	43
VIKING STAR	WAS4138	Kodiak	0	4	5	0	8	0	2	0	1	11	0	0	31
VINCENT THOMAS BRIDGE	H3WJ	Seattle	0	0	32	57	66	46	32	40	43	47	0	0	363
VIRGINIA BRIDGE	HOKP	Anchorage	30	28	37	34	42	16	24	31	31	35	0	0	308
VIRGINIAN	KSPH	Oakland	94	43	0	0	32	0	30	15	0	54	0	0	268
VIRGO VOYAGER	C6FG8	New Orleans	34	4	0	4	24	14	5	1	3	0	0	0	89
VLADIVOSTOK	P3BJ8	Seattle	0	0	0	0	0	15	51	65	54	6	0	0	191
VOLENDAM	PCHM	Anchorage	24	5	19	14	22	9	0	0	0	14	0	0	107
WARRIOR	WBN4383	Anchorage	0	0	0	0	0	0	0	0	0	1	0	0	1
WASHINGTON VOYAGER	KFDB	Oakland	5	6	4	0	6	7	2	0	9	2	0	0	41
WECOMA	WSD7079	Seattle	74	37	85	102	47	61	84	68	82	36	0	0	676
WESTERDAM	PINX	Miami	2	19	21	2	0	0	0	0	1	16	0	0	61
WESTERN MARINER	WRB9690	Anchorage	0	0	0	0	0	1	1	0	0	0	0	0	2
WESTERN RANGER	WBN3008	Anchorage	2	6	9	3	17	17	13	0	1	0	0	0	68
WESTWARD VENTURE	KHJB	Seattle	0	23	4	72	36	41	53	41	63	34	0	0	367
WESTWOOD ANETTE	C6QO9	Seattle	7	5	2	18	24	11	10	11	6	7	0	0	101
WESTWOOD COLUMBIA	C6SI4	Seattle	19	35	52	41	47	38	42	40	34	58	0	0	406
WESTWOOD MARIANNE	C6QD3	Seattle	22	68	66	58	13	6	10	4	14	0	0	0	261
WESTWOOD OLYMPIA	C6UB2	Seattle	0	39	48	64	38	17	20	1	30	26	0	0	283
WESTWOOD RAINIER	C6SI3	Seattle	11	40	42	49	31	31	14	25	31	83	0	0	357
WESTWOOD VICTORIA	C6SI6	Seattle	44	35	45	54	53	28	23	28	30	29	0	0	369
WILFRED SYKES	WDA2769	Chicago	7	0	8	14	16	12	0	17	5	9	0	0	88
WILSON	WNPD	New Orleans	0	24	34	0	28	30	11	33	13	20	0	0	193
WOLDSTAD	KF001	Kodiak	17	5	18	6	7	46	29	9	0	24	0	0	161
WOLVERINE	WZC4518	Chicago	0	0	0	0	0	0	27	30	30	24	0	0	111
WORLD SPIRIT	ELWG7	Seattle	30	57	50	35	49	52	31	0	0	0	0	0	304
YANGTZE STAR	SZJP	New York City	0	0	1	0	0	0	0	0	0	0	0	0	1
YM GENOVA II	ELVX2	New York City	45	42	65	54	61	50	75	73	75	66	0	0	606
ZAANDAM	PDAN	Miami	0	0	5	6	3	2	6	1	24	8	0	0	55
ZENITH	C6FU3	Miami	10	10	11	13	7	0	0	0	0	4	0	0	55
ZIM BEIJING	A8FU7	New York City	0	0	0	0	0	0	48	58	39	32	0	0	177
ZIM HONG KONG	9HGP7	Houston	7	16	0	0	0	0	28	0	16	41	0	0	108
ZIM ISRAEL	4XGX	New Orleans	1	0	0	0	0	0	0	0	0	0	0	0	1
ZIM SAVANNAH	A8ER9	New York City	0	0	0	0	2	0	7	10	20	44	0	0	83
ZIM SHENZHEN	VQUQ4	New York City	0	0	0	0	0	0	27	28	24	36	0	0	115
ZUIDERDAM	PBIG	Anchorage	0	0	0	0	0	0	0	0	0	6	0	0	6

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
TOTAL SHIPS: 738	14,614	15,222	15,871	15,858	15,718	15,522	17,602	17,461	18,583	19,291	0	0	165,742

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In this Issue:

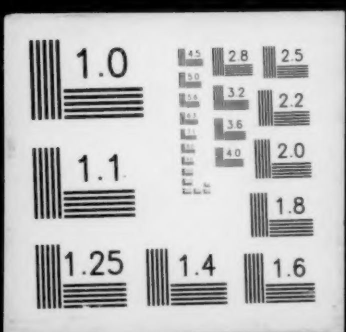
NOAA Offers Hard, Cold Facts About Great Lakes Ice in Electronic Atlas 4

Vessel Icing 9

The VOS Climate Project—The Way Ahead 16

Cape of Storms—August 2005 22

MARAD Ships Help in Hurricane Recovery 24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